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PANEL DIAL SWITCHING SYSTEM

(BATTERY CUT-OFF — WITHOUT ZONE REGISTRATION)

TRAINING MANUAL

SEQUENCE CHARTS AND OPERATIONAL SKETCHES

THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY

OPERATION AND ENGINEERING DEPARTMENT

PLANT OPERATION DIVISION

FOR TRAINING PURPOSES ONLY

FEBRUARY 1955

PREFACE

This provisional training material covers the Panel System, Battery Cut-Off type. - without Zone Registration

This manual contains a series of typical circuit diagrams. These are drawn in the simplified style which is used in teaching the complex 'Common Control' switching systems now in current use. This method makes use of sequence charts and operational sketches. This volume contains a chart and sketch for each of the typical circuits.

Since the drawings are intended to be used in the study of the Panel System, Battery Cut-Off type, without zone registration, and do not necessarily conform to any particular office, it may be necessary to consider the regular Schematic Drawings (SD's) and Circuit Descriptions (CD's) when preparing learners to work in a specific office.

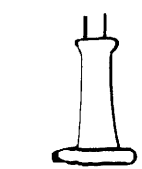
Students should be cautioned that the particular circuits contained in this manual are intended to be used as training aids, and are not necessarily applicable for maintenance.

INDEX OF OPERATIONAL SKETCHES

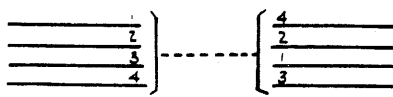
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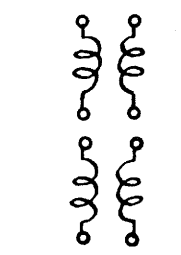
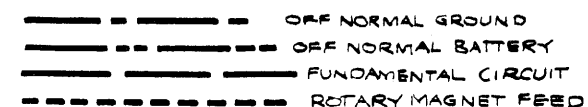
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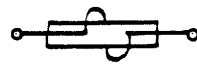
RECEIVER



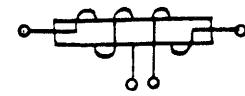
METHOD OF CONNECTING WIRING POINT TO POINT



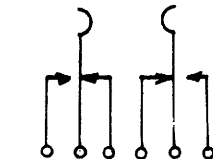
REPEAT COIL



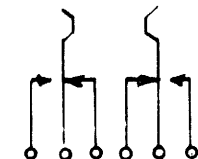
RETARD COIL WDS.



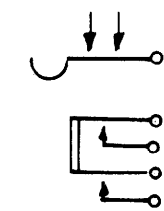
RETARD COIL 2 WDS.



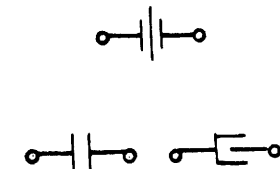
NON LOCKING KEY



LOCKING KEY



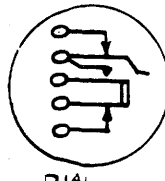
HOOK CONTACTS



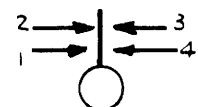
CONDENSERS



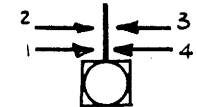
TRANSMITTER



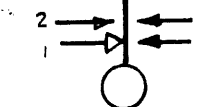
DIAL



SEQUENCE SWITCH CAM AND SPRINGS

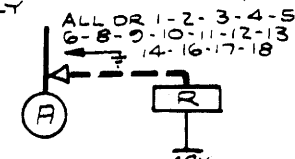


SILVER PLATED CAM

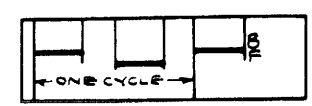


NO. 1 SPRING CLOSED ALL POSITIONS

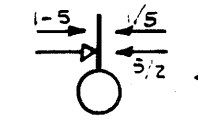
NUMBERS INDICATE POSITIONS IN WHICH CAM IS BROKEN ON "A" CAM ONLY



ROTARY MAGNET

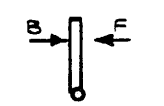


METHOD OF SHOWING INTERVAL OF INTERRUPTION

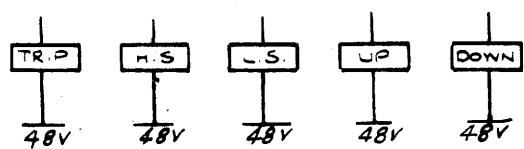


SEQUENCE SWITCH CAM CUTTINGS

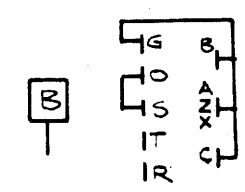
1-5 MEANS CLOSED ONLY IN POS. 1 & 5
1/5 MEANS CLOSED CONTINUOUSLY POS. 1 TO 5 INC.
5/2 MEANS CLOSED CONTINUOUSLY POS. 5 TO 2 INC.



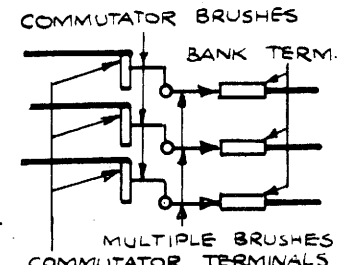
INTERRUPTER



CLUTCH MAGNETS
H.S. HIGH SPEED
L.S. LOW SPEED



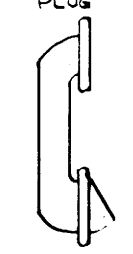
COMMUTATOR SEGMENT AND BRUSH STRAPPING



COMMUTATOR BRUSHES
BANK TERM.
MULTIPLE BRUSHES
COMMUTATOR TERMINALS



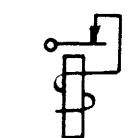
PLUG



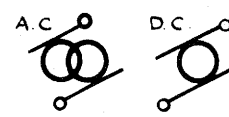
HANDSET



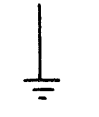
A.C. RINGER



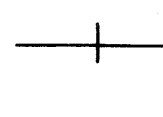
BUZZER



GENERATOR



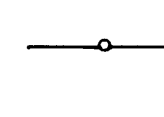
GROUND



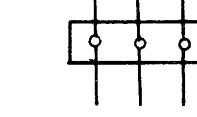
WIRING NOT CONNECTED



WIRING CONNECTED



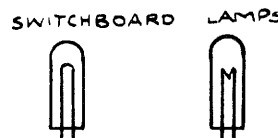
TERMINAL



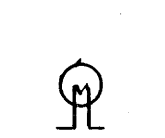
TERMINAL STRIP



CLOCK OR MESSAGE REGISTER



CARBON FILAMENT



METALLIC FILAMENT



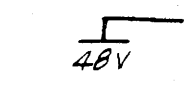
RESISTANCE LAMP



VACUUM TUBE



METER



48V BATTERY



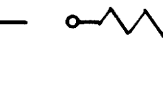
STRAP LEAD



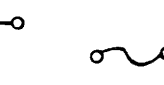
CROSS CONNECT



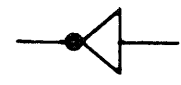
ALTERNATE WIRING



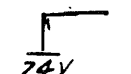
RESISTANCE



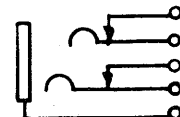
FUSE



CONTACTS ON COIN ROTARY SELECTOR

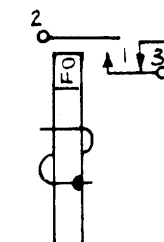


24V BATTERY

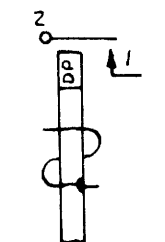


JACK

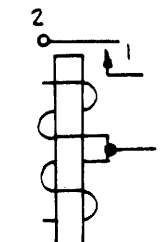
RELAYS



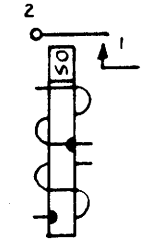
FAST OPERATING
MAKE BEFORE BREAK CONTACTS



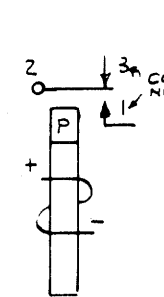
DASHPOT



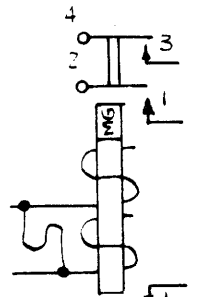
2 INDUCTIVE WINDINGS
DIFFERENTIAL



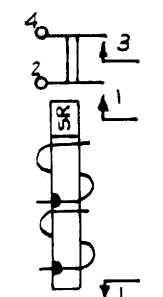
SLOW OPERATING



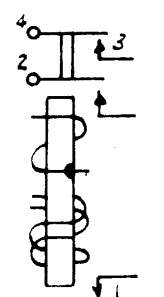
POLARIZED



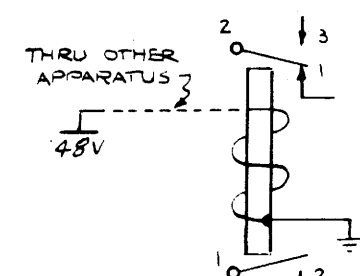
MARGINAL
2 INDUCTIVE WINDINGS
1 NON-INDUCTIVE WINDING



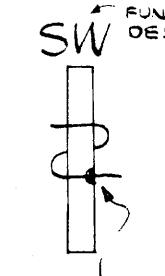
SLOW RELEASE



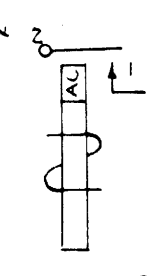
1 INDUCTIVE WINDING
1 NON-INDUCTIVE WINDING



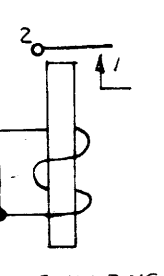
NORMALLY OPERATED



INDICATES INNER
END OF WINDING
USUALLY CONNECTED
TO GROUND



ALTERNATING
CURRENT



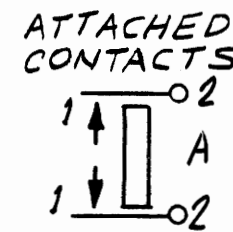
1 INDUCTIVE WINDING
1 NON-INDUCTIVE WINDING

THE SYMBOLS AND CONVENTIONS FOR THE OPERATIONAL SKETCHES ARE THE SAME AS THOSE USED ON SCHEMATIC DRAWINGS (SD-1) WITH THE FOLLOWING EXCEPTIONS.

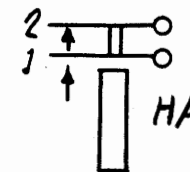
1. DETACHED CONTACT SYMBOLS ARE USED WHENEVER THEIR EMPLOYMENT AIDS IN SIMPLIFYING THE SKETCHES. THEY ARE SHOWN THUS:

(A) MAKE CONTACTS:

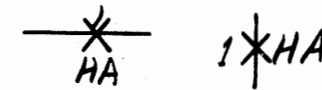
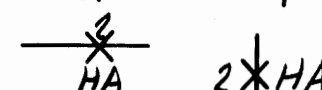
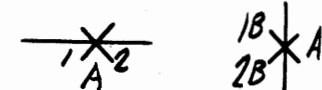
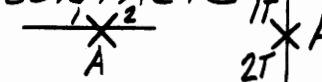
ALL RELAYS HAVING TOP AND BOTTOM SPRINGS.



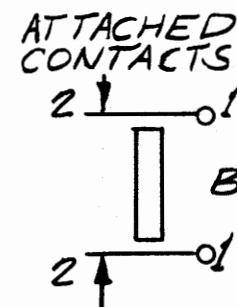
ALL RELAYS NOT HAVING TOP AND BOTTOM SPRINGS. (MULTI-CONTACT)



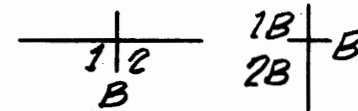
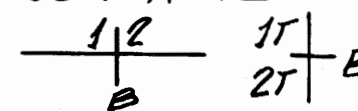
EQUIVALENT DETACHED CONTACTS



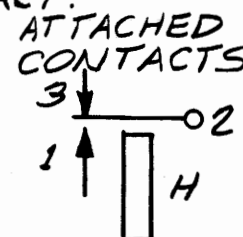
(B) BREAK CONTACTS:



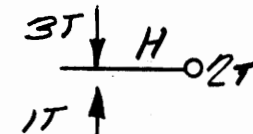
EQUIVALENT DETACHED CONTACTS



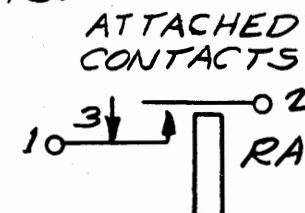
(C) TRANSFER CONTACT:



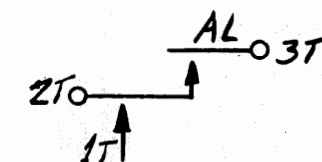
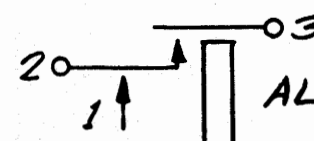
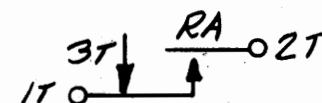
EQUIVALENT DETACHED CONTACTS



(D) OTHER CONTACTS:

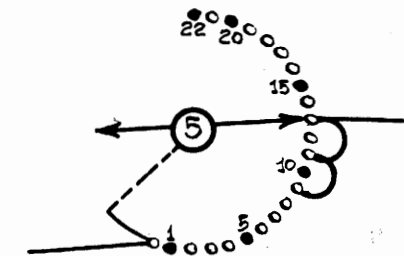


EQUIVALENT DETACHED CONTACTS

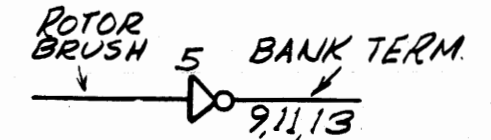


(E) 206 AND SIMILAR TYPE SELECTORS.

ATTACHED CONTACTS

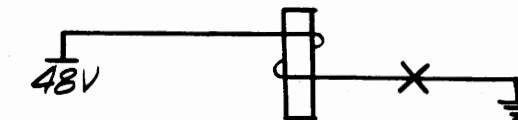


EQUIVALENT DETACHED CONTACTS



2. INNER ENDS OF WINDINGS ARE OMITTED.

3. BATTERY SYMBOL WITH THE NOMINAL VOLTAGE IS SHOWN THUS:



4. CONTACT PROTECTIONS IN GENERAL ARE OMITTED.

5. SEQUENCE CHARTS ARE IN GENERAL PROVIDED ON EACH SKETCH. THE DESIGNATIONS FOR ALL RELAYS OF WHICH THE OPERATING PATHS ARE SHOWN ON THE SKETCH ARE IN HEAVY CHARACTERS. ALL OTHERS ARE IN LIGHT CHARACTERS.

6. IN GENERAL STRAPPING OR MULTIPLE CONVENTIONS ARE OMITTED.

7. $\overline{TB0-TB9}$ INDICATES THAT THE MAKE CONTACTS (ONE EACH) ON RELAYS TB0 TO TB9 ARE WIRED IN PARALLEL.

8. $\overline{CB-}$ INDICATES A MAKE CONTACT ON ONE OF A SERIES OF CB RELAYS.

9. GA/GB INDICATES THAT EITHER GA OR GB DESIGNATION APPLIES.

10. $\overline{TR}$ JACK INDICATES A BREAK CONTACT ON THE TR JACK.

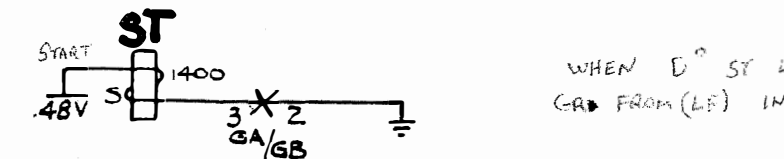
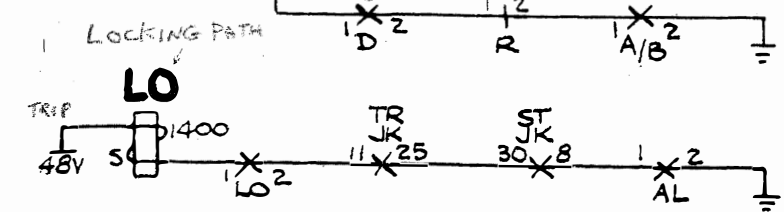
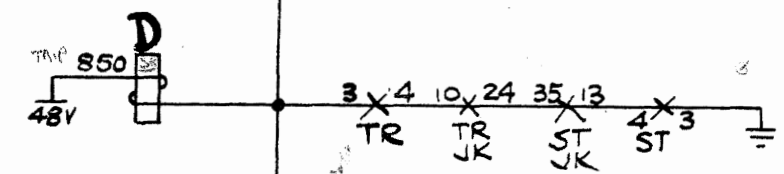
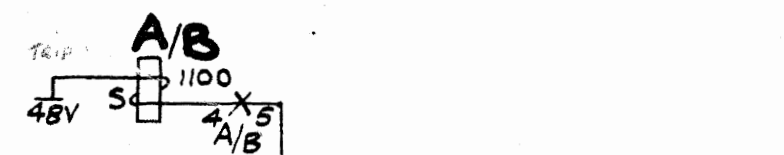
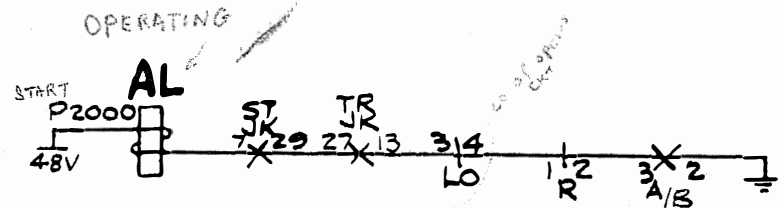
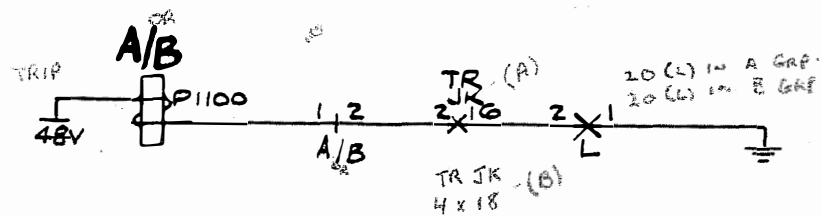
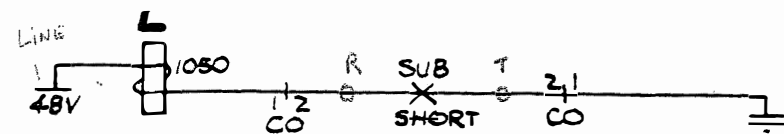
11. $\overline{MB}$ JACK INDICATES A MAKE CONTACT ON THE MB JACK.

12. ⏏ INDICATES OFF-NORMAL GROUND

⏏ INDICATES OFF-NORMAL BATTERY

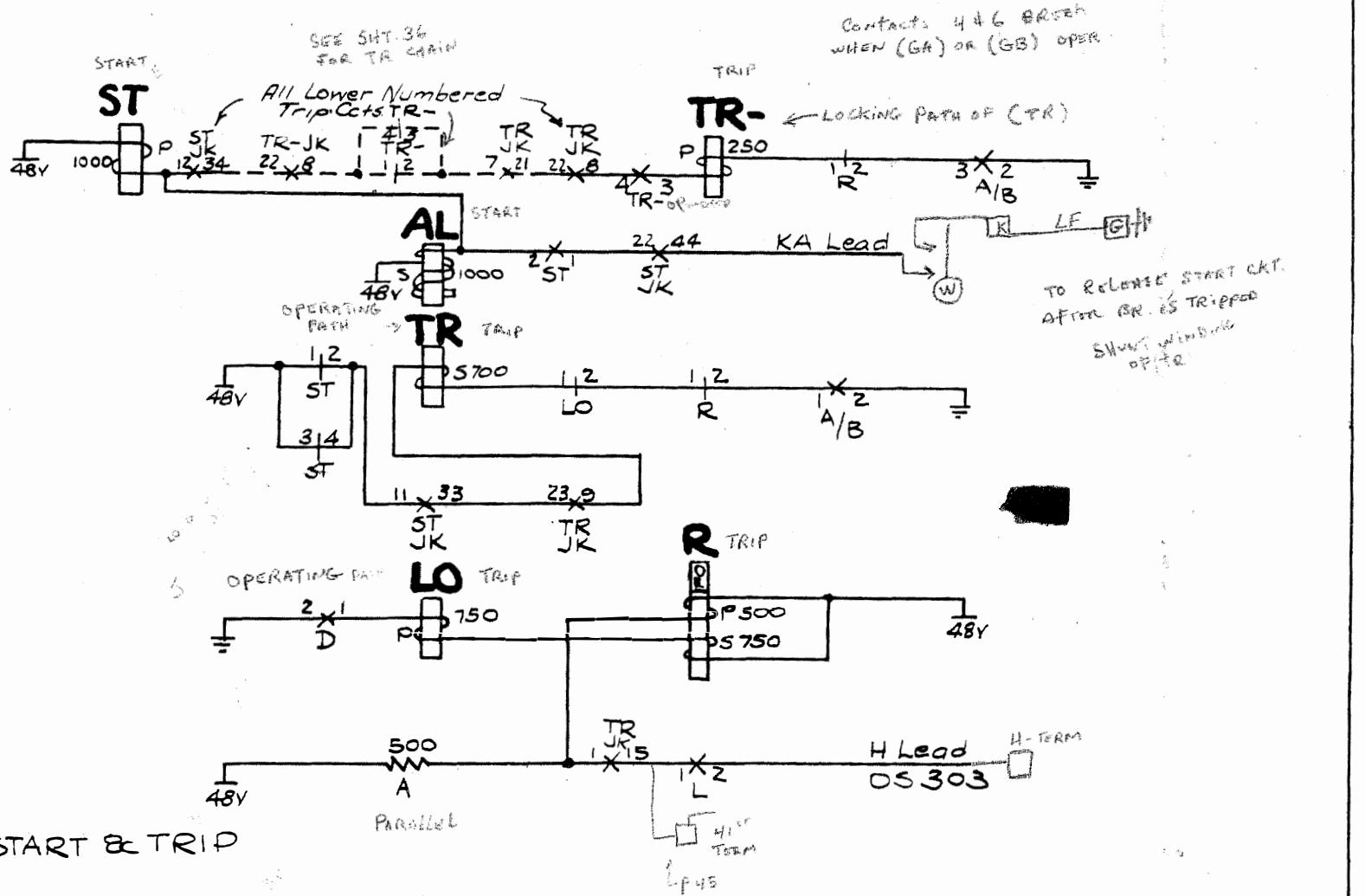
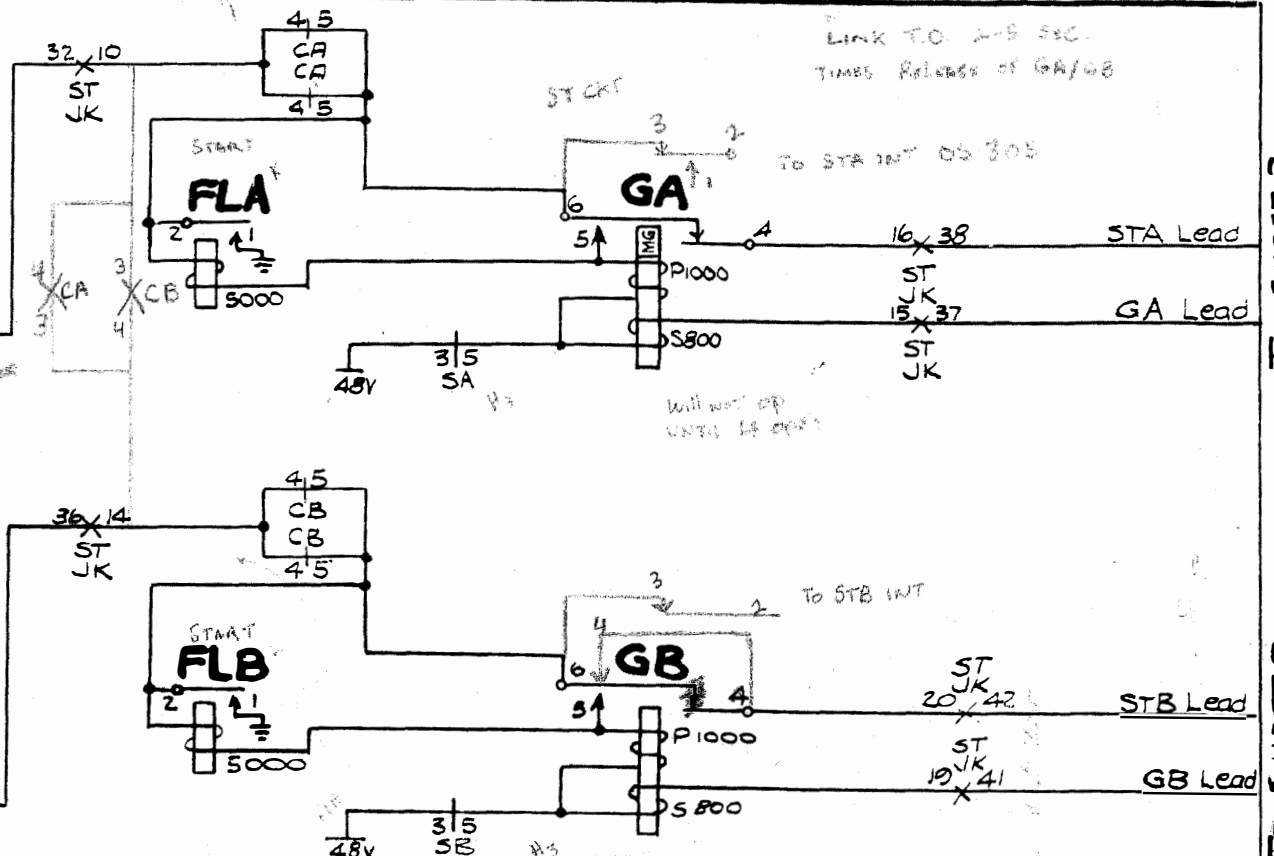
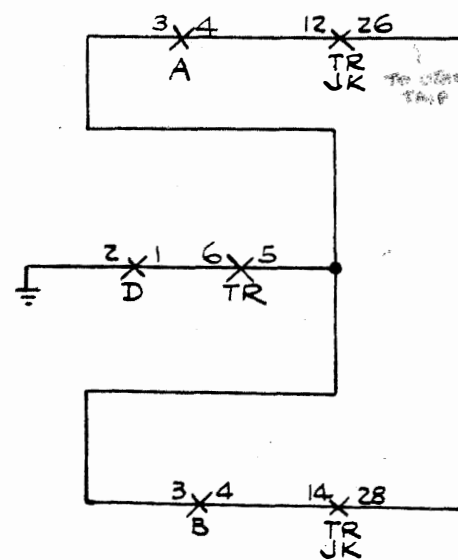
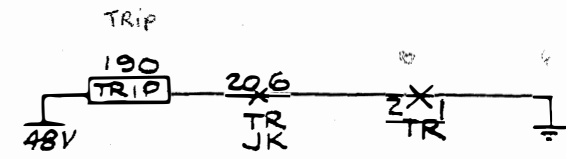
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
LEGEND FOR
OPERATIONAL SKETCHES
PANEL SYSTEM
BATTERY CUT-OFF

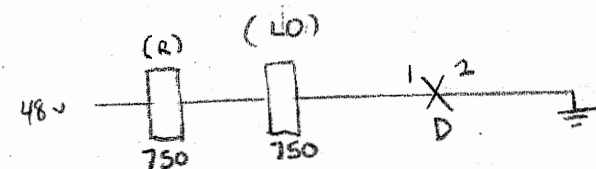
OS-300



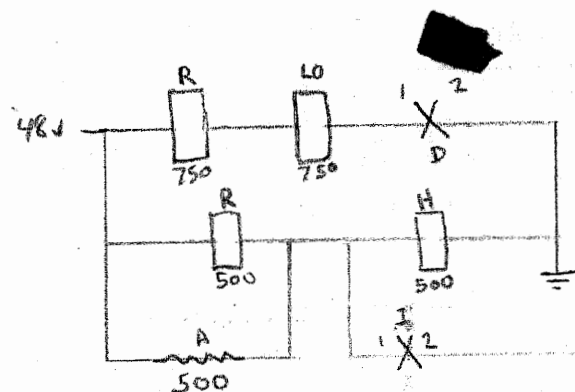
TO HOLD ALL (LO)'S OPER
UNTIL ALL (A) OR (B)'S OPER

WHEN D'S ST LEAD IS CLOSED
CIR FROM (LF) IN DIST - OPERATES (GA) IN LF

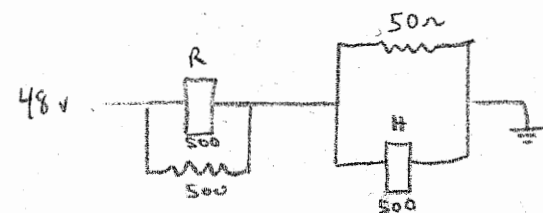
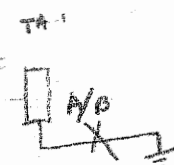




(LO) OPR
(R) FAILS TO OPR
32 MA



(H) OP
(R) FAILS TO OP
64 MA

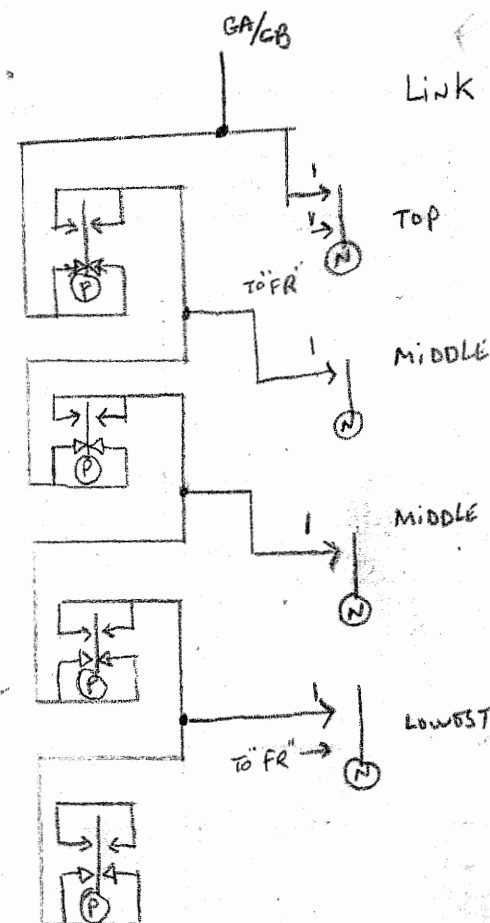


AFTER (H) OPR'S
(R) WILL OPR
ABOUT 144 MA

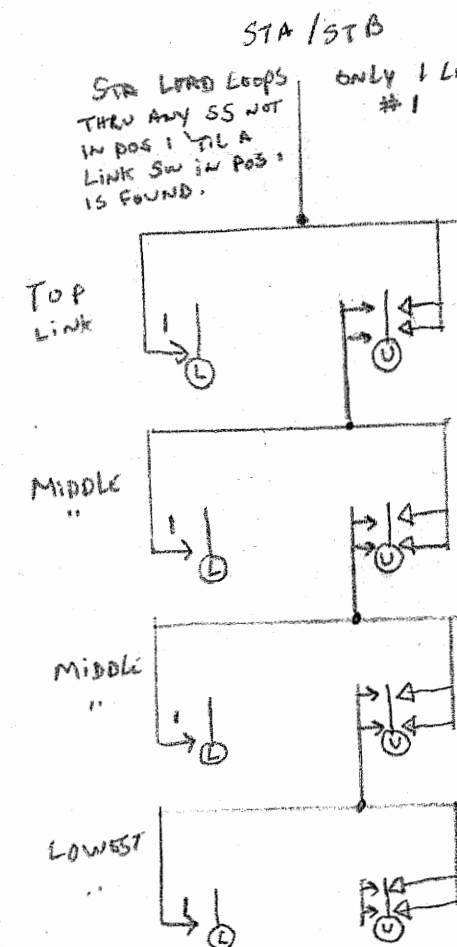
"GA" LOOPS THRU
ANY SWITCHES UNTIL
ONE IS FOUND IN POS 1

1 & 4 OF (P)
MADE ALWAYS

2 & 3 OF (P)
MADE 2/9
11/18



GA/CB LEAD SIMILAR
EXCEPT P & N CAMS USED
SEE



3 & 4 (P) MADE ALWAYS

1 & 2 (P) NOT MADE POS 1

CATHS MAKE $\frac{1}{4}$ BEFORE & $\frac{1}{4}$ AFTER

SEE OS 54 FOR TRANSFER & THROWOVER

OPR. OF GA/GB OPENS
STA/STB LEAD, SO OTHER
GA/GB MAY OPR WHEN
LF OPR.
(other calls may start)

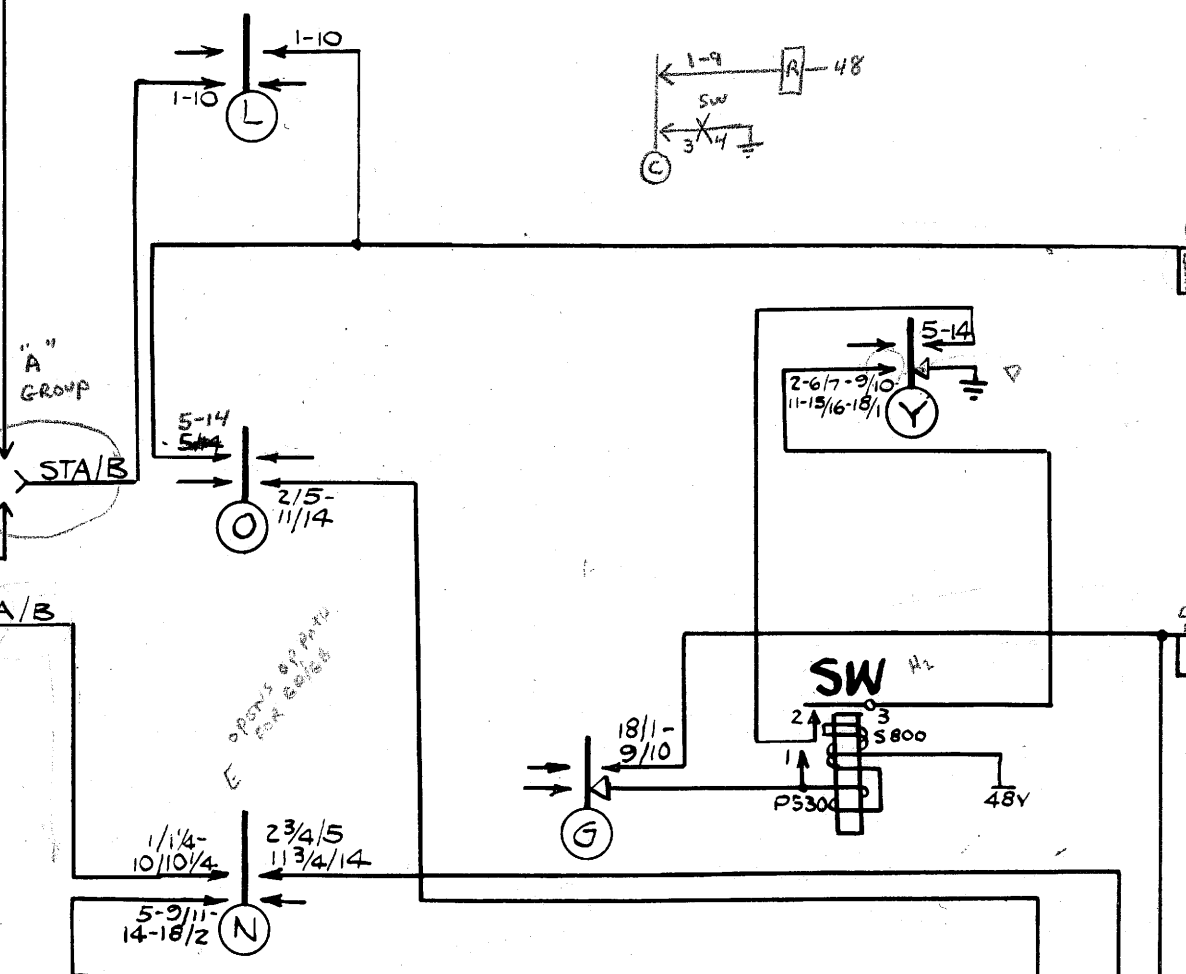
FLA/FLB SHUNTS
DOWN WHEN (GA)
OR (GB) OPR.

TRIP CKT A
TIMES TO A/O
(5-12 SEC)

COMB. OF ③ & ④ WILL TAKE
YOU TO (STA) OR (STB) LEADS

To Sheet 1

To Sheet 1

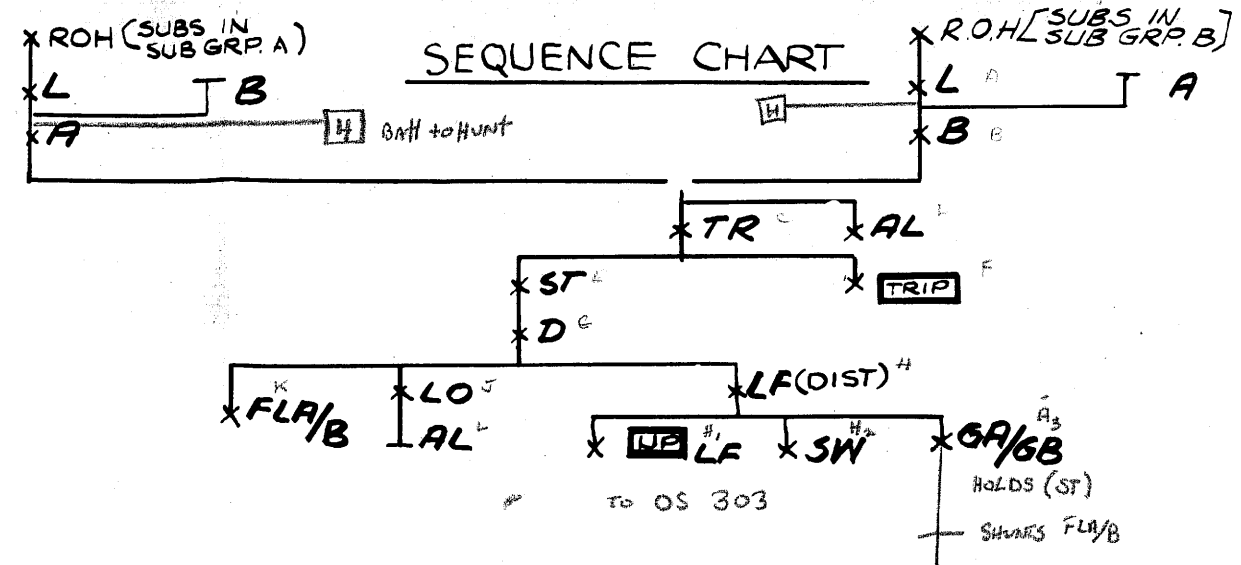


SEE REVERSE
FOR STA/STB
&
GA/GB LEADS

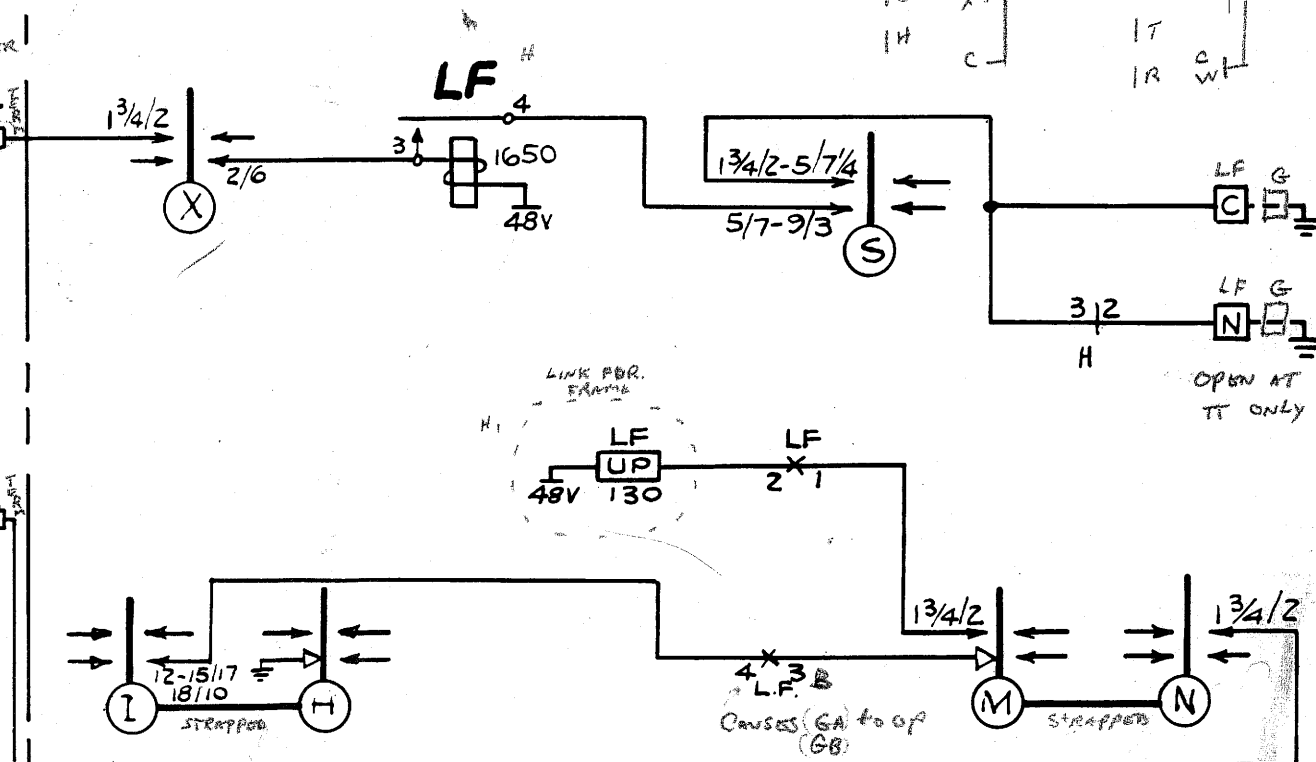
LINK SWITCH
1-10 AWAIT CALL
2-11 HUNT SENDER

LINK
T-R-TR Top Mult. BR
FT-FR-SC Bottom Mult. BR
SS & DF

FT FR
To SDR
See OS 319
Sheet 1



LINE FINDER	DISTRICT
IG M	IG B
IT N	IO A
IR K	IS X
IS X	IT C
IH C	IR W



DIST. RI SWITCH
1. NORMAL
2. AWAIT CALL/LF HUNT

DISTRICT

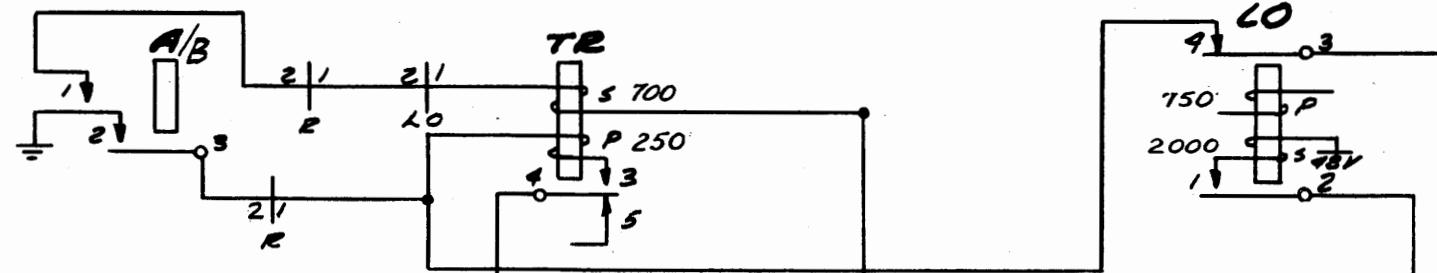
S.D. 21077-011 LINE, FIND. & DIST. CTT.
S.D. 20294-011 LINE, TRIP, START, LINK CTS.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
STARTING LINE FINDER
PANEL SYSTEM
BATTERY CUT-OFF **OS-301**

SHEET 2 OF 2

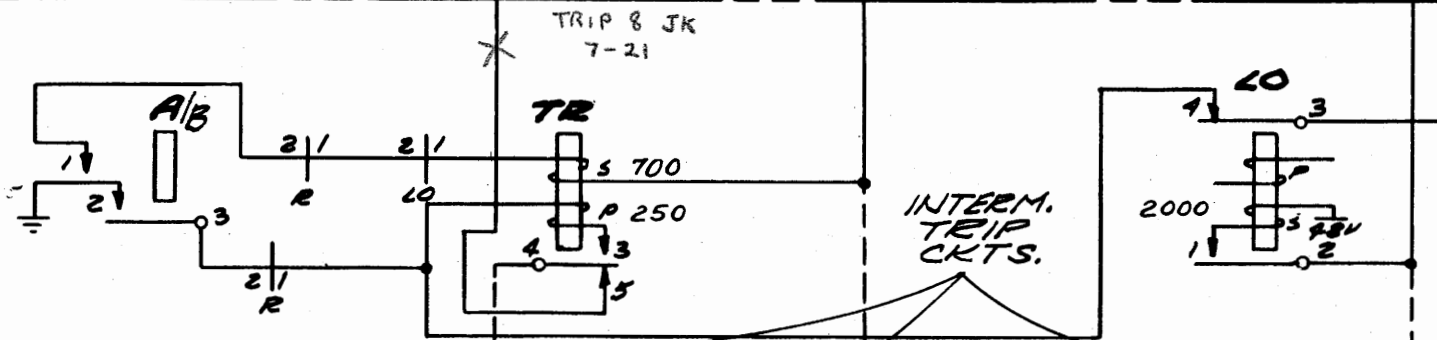
LINE GROUP ALLOTTING CKTS.

LINE & LINK ALLOTTING CKTS. 36

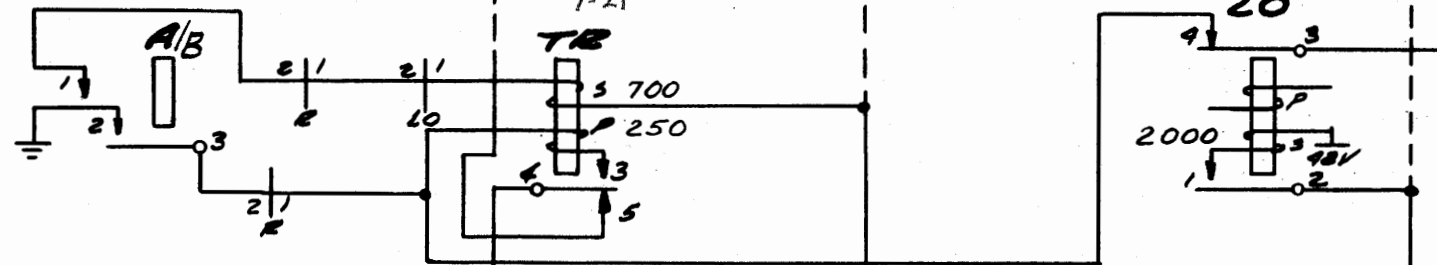
TRIP 9



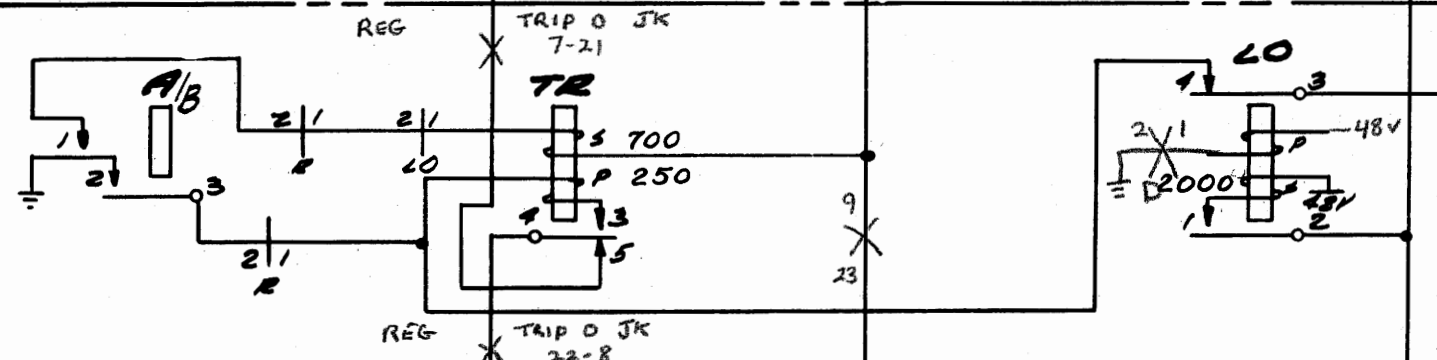
TRIP 8



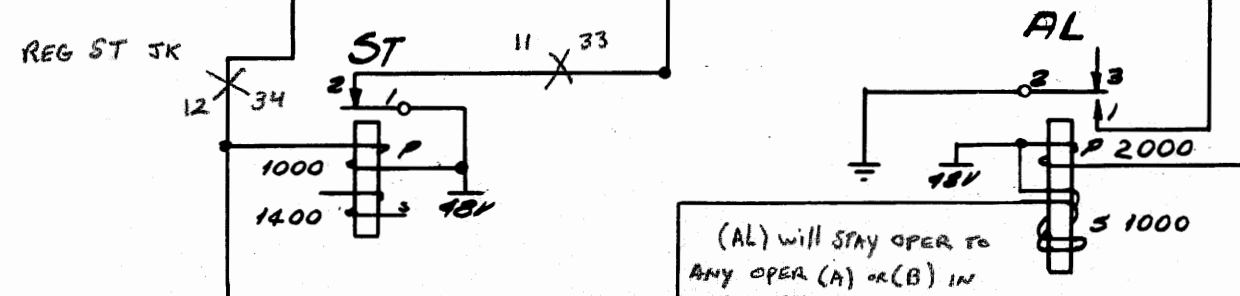
TRIP 1



TRIP 0



START



LAST LINK

INTERMEDIATE LINKS

SECOND LINK

FIRST LINK

(LO) WILL LOCK TO (AL) IF (AL) STAYS OPR

LINK SWITCH

- 1-10 AWAIT. CALL
- 2-11 HUNT. SNDR. & ROLLS NEXT LINK TO ALLOTTING
- 9-18 AWAIT. ALLOTMENT

SD 20294-011 LINE, TRIP, START & LINK CKTS.

PLANT SCHOOL FOR TRAINING PURPOSES ONLY

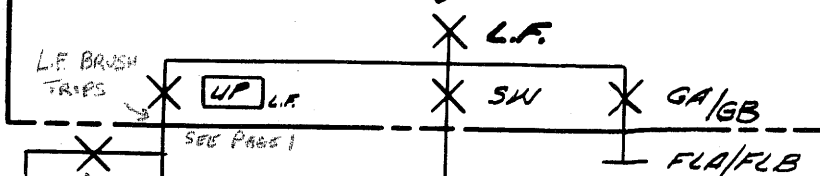
TRIP & LINK CIRCUIT ALLOTTING 36

PANEL SYSTEM BATTERY CUT-OFF OS-302

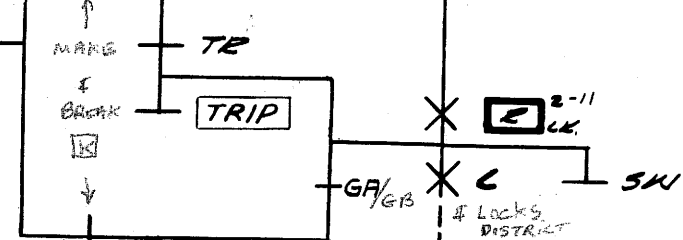
(AL) WILL STAY OPER TO ANY OPER (A) OR (B) IN OTHER TRIP CKT IF ITS (LO) IS NORMAL

SEQUENCE CHART

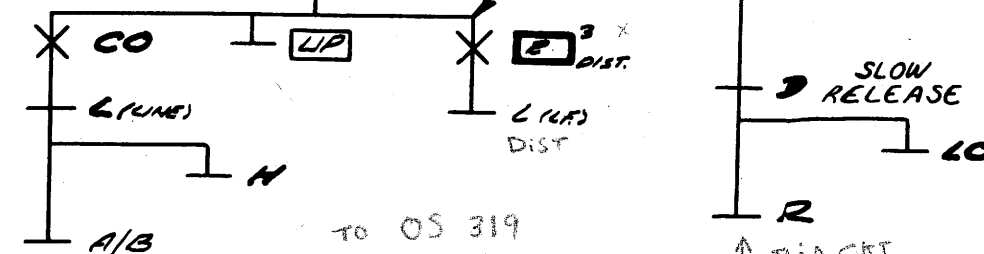
(SHOWN ON OS #304)



NOTE 1



NOTE 2



TO OS 319

↑ TRIACK
RELEASED

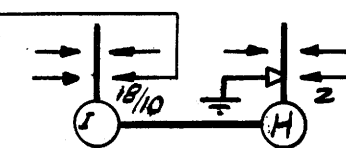
TO INSURE
AR. ONTARIO

(TR)⁻ SANTI DOWN
WITHIN A⁰

(ST) WHEN 

DIST. P1 SWITCH

- 1- NORMAL
2- AWAIT. CALL/L.F. HUNT.
3- AWAIT. SNDR. FOR D. BR. SEL.



NOTES

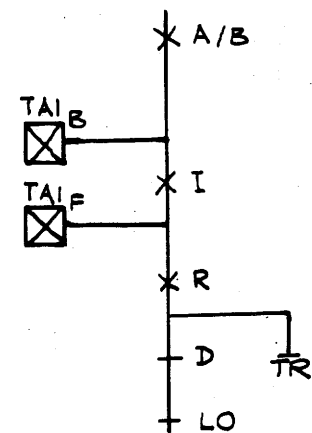
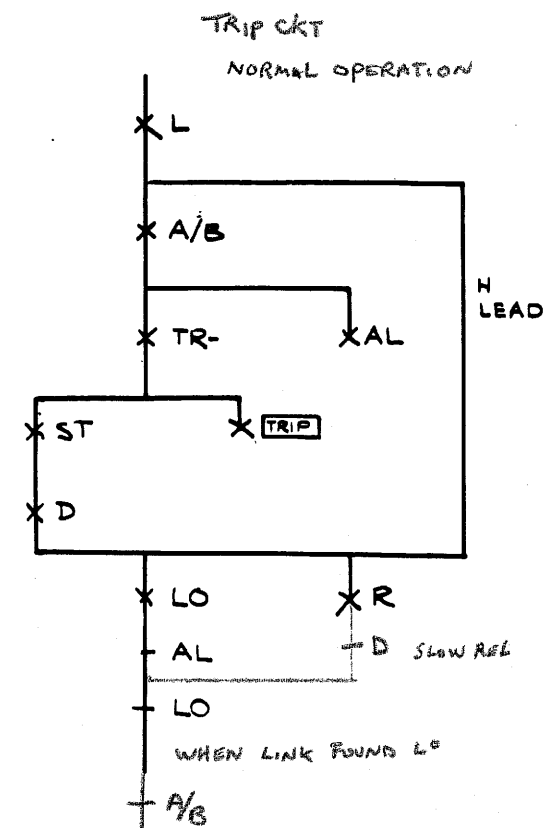
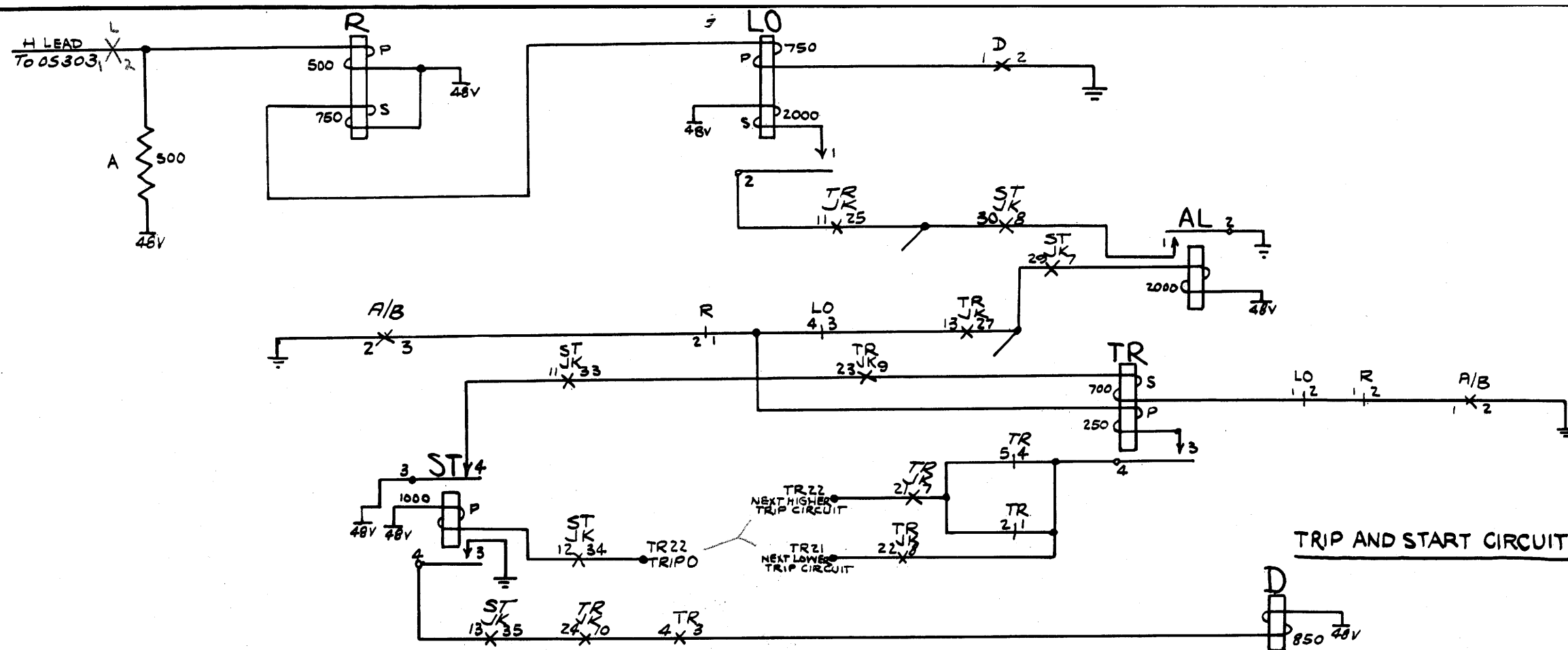
1. WHEN "K" COMM. MAKES "TR" RELEASES.
" " " BREAKS "ST" " "
2. WHEN "C" COMM. BREAKS "LF" RELEASES
3. "H" OPERATES WHEN LINE IS FOUND.

S.D. 21077-011 L.F. & DIST CCT.
S.D. 20294-011 LINE TRIP START & LK. CCT.

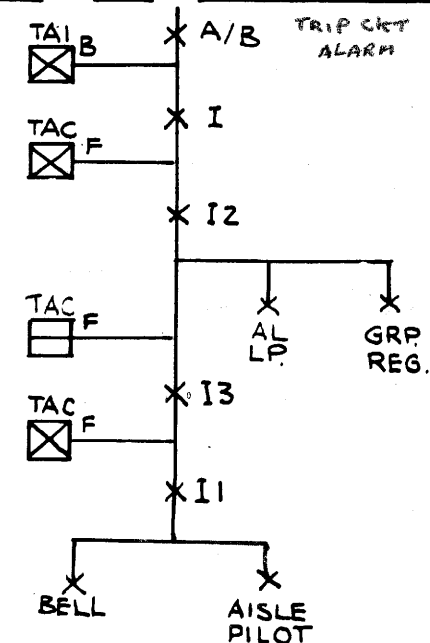
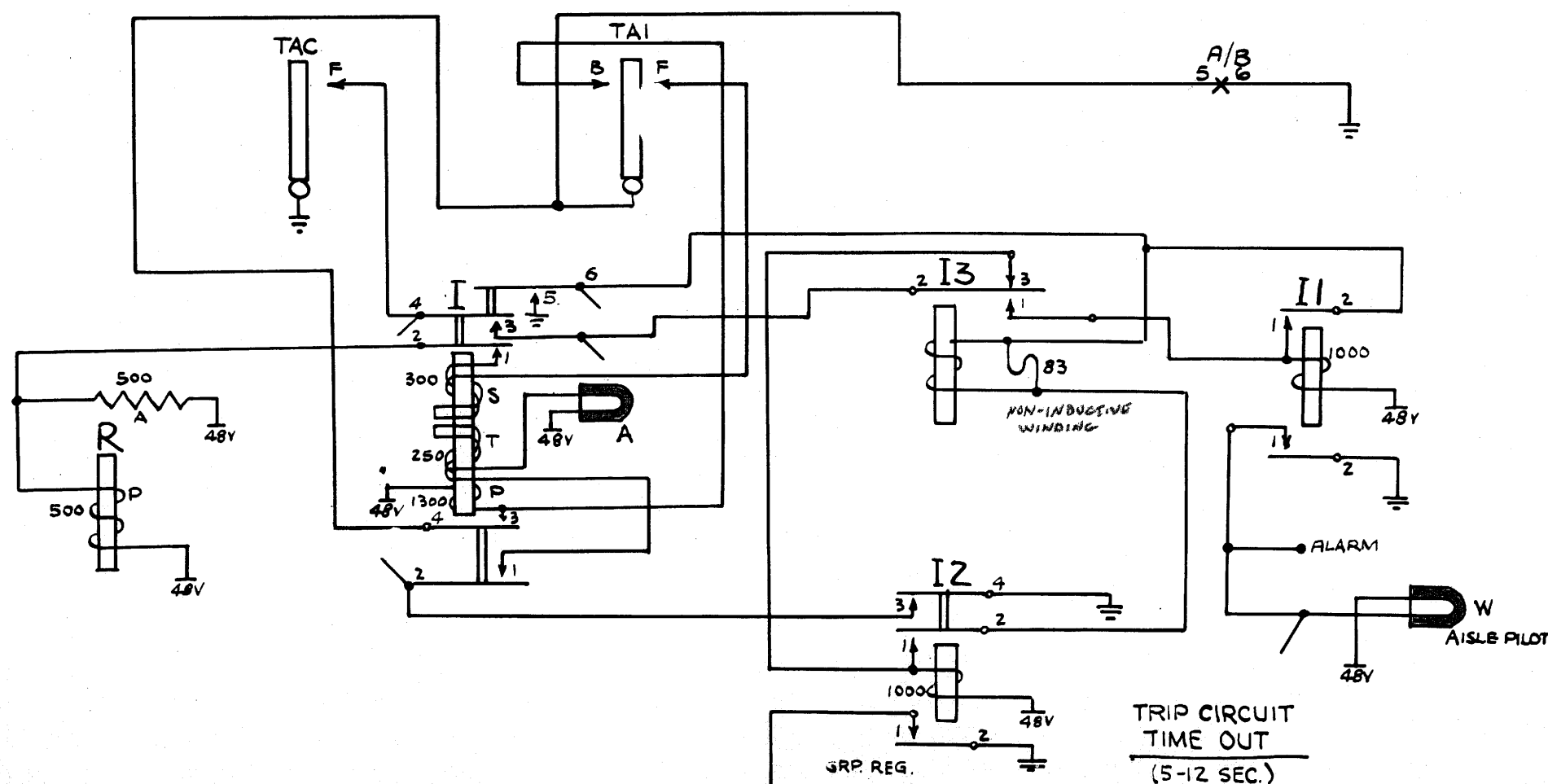
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

FINDING LINE

PANEL SYSTEM BATTERY CUT-OFF	OS-303
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OTHER TRIP CKT'S OK
IF BR FAILS TO
TRIP AS P.45



CD 20294
P. 6 P. 13

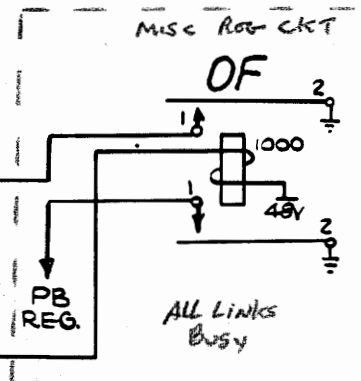
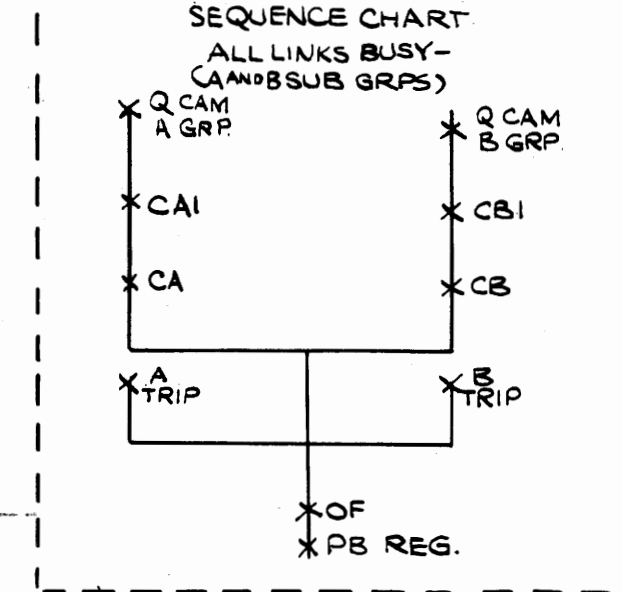
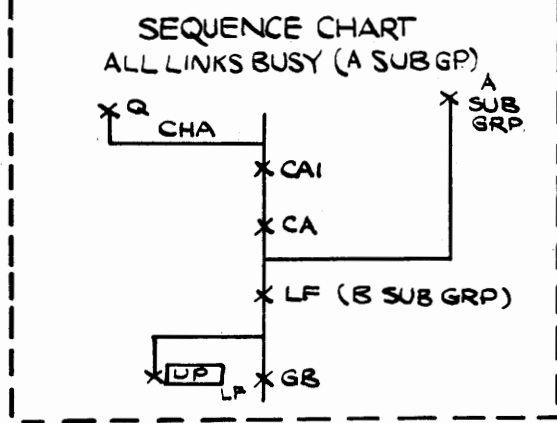
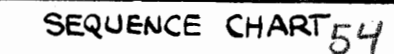
S.D. 20294-011 LINE, TRIP, START & LINK CCLT.

**PLANT SCHOOL
FOR TRAINING PURPOSES ONLY**

TRIP AND START CIRCUIT
TRIP CIRCUIT TIME OUT

PANEL SYSTEM BATTERY CUT-OFF	OS-304
---------------------------------	--------

5



S.D. 20294-011 LINE TRIP, START & LINK COT.

PLANT SCHOOL FOR TRAINING PURPOSES ONLY	
START CIRCUIT FAILURE 54 ALL LINKS BUSY & OVERFLOW	
PANEL SYSTEM BATTERY CUT-OFF	05-305

SUB GROUP A & B
KEY TRANSFER
AT LINK FRAME

LINK

B GROUP

A GROUP

KB DART. DIST AUTO ROUTE TST

KADART.
SUB A
KA
KB
SUB B
DIST.

MB PLUG ADVANCES
LINK OUT OF POS 1

X R^L₂
X L DIST
X R³_D

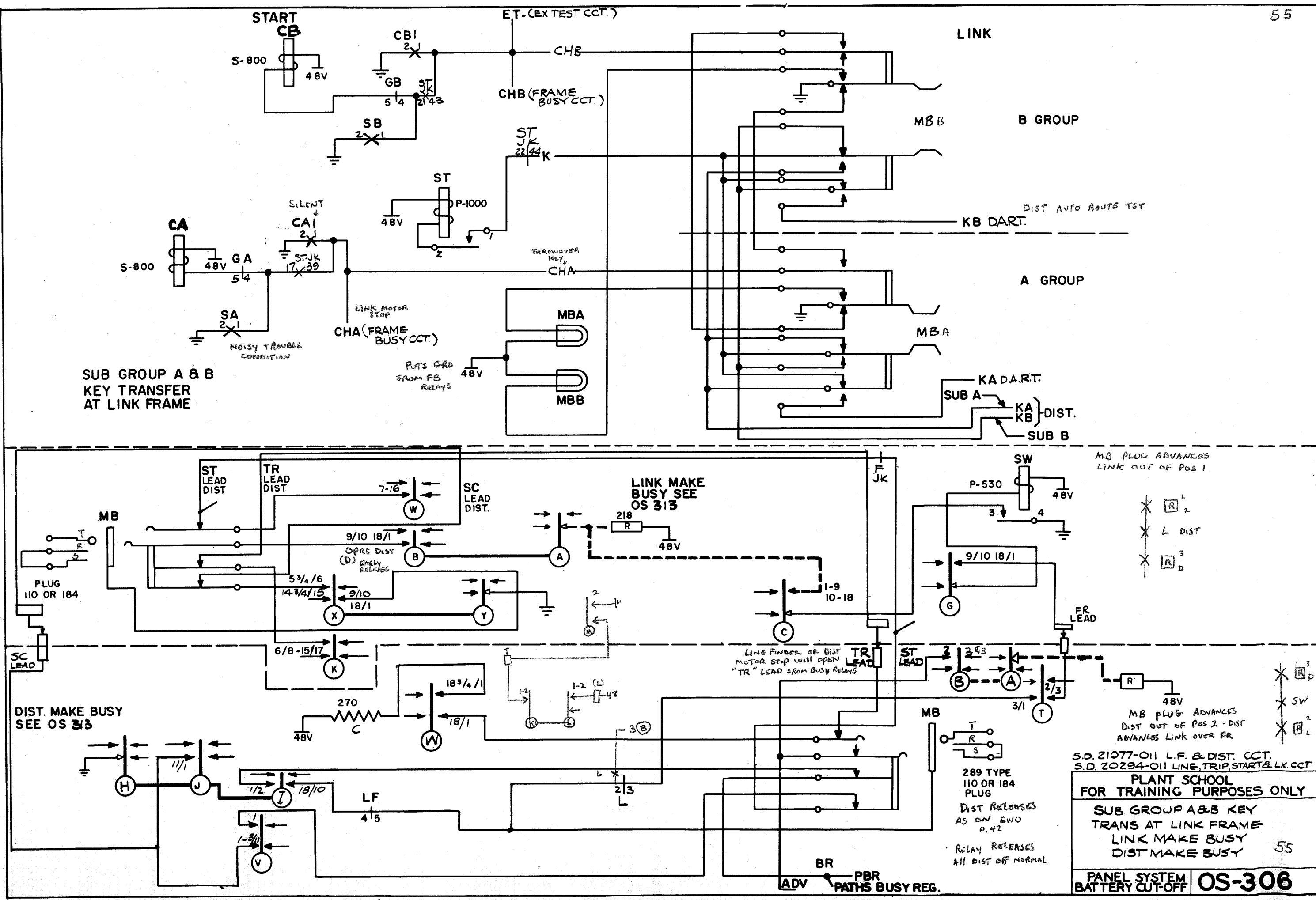
MB PLUG ADVANCES
DIST OUT OF POS 2 - DIST
ADVANCES LINK OVER FR

S.D. 21077-011 L.F. & DIST. CCT.
S.D. 20294-011 LINE, TRIP, START & LK. CCT.

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

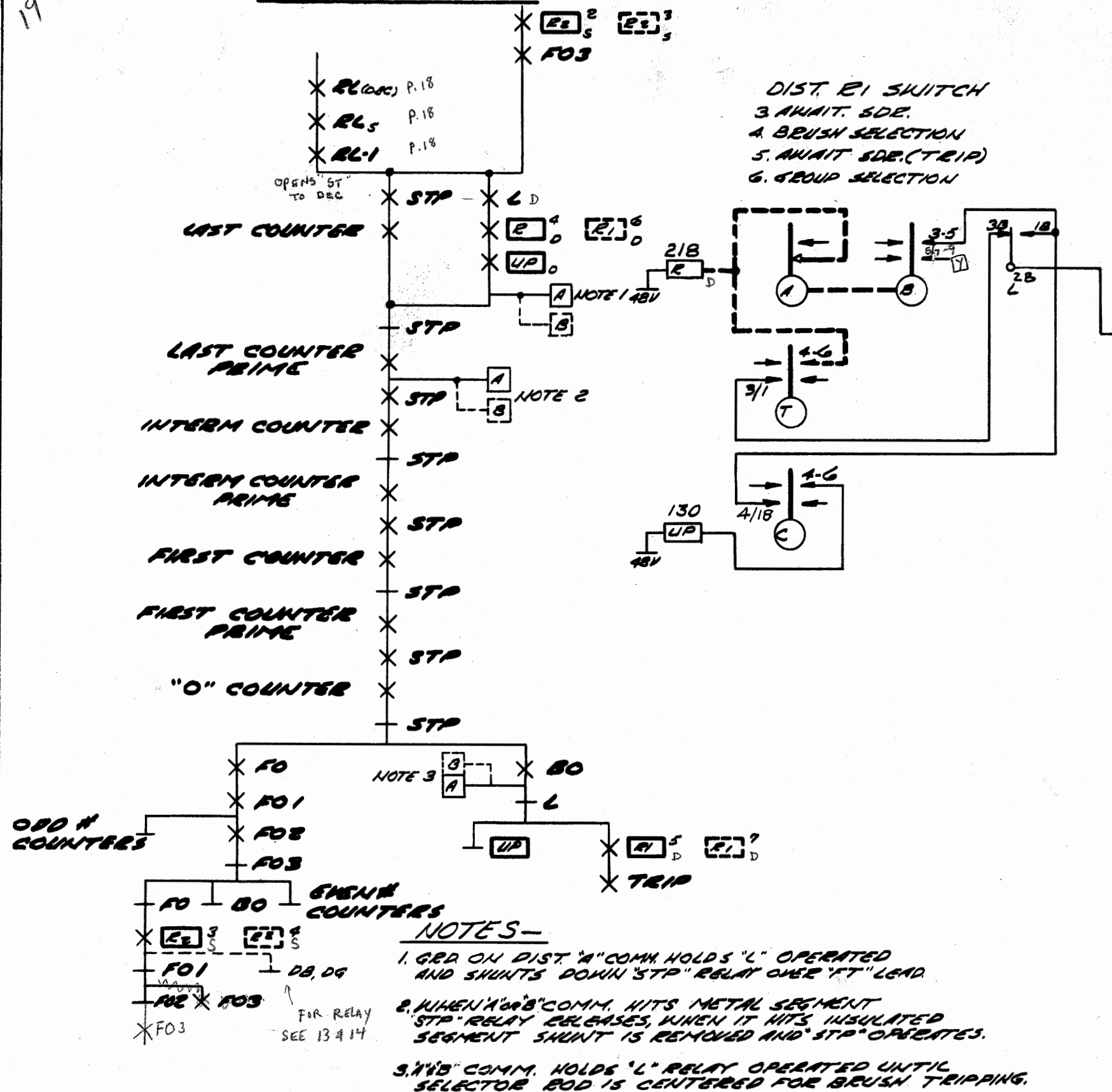
SUB GROUP A&B KEY
TRANS AT LINK FRAME
LINK MAKE BUSY
DIST MAKE BUSY

PANEL SYSTEM
BATTERY CUT-OFF OS-306



ISSUE 1
JAN 1950

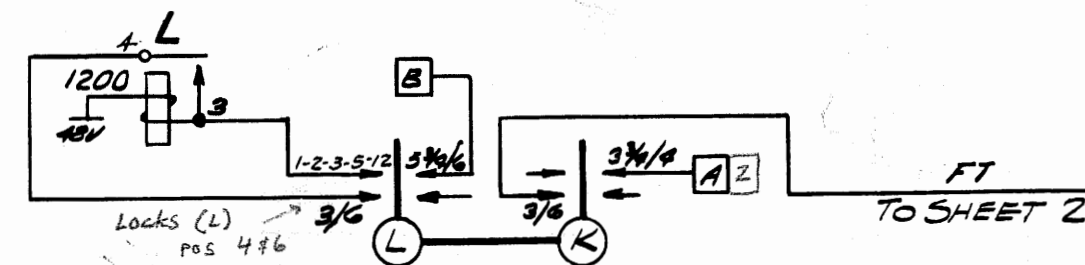
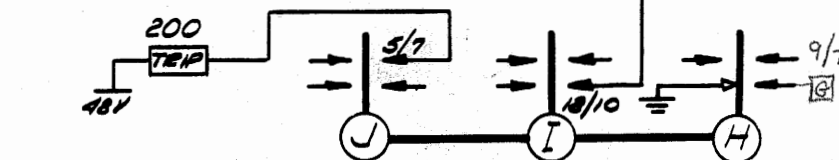
SEQUENCE CHART



TO: CHECK FOR CROSSES IN COUNTER RELAYS

- TOOTH PICK OPR (RL) & (MB)
- GRD TEST REL-TOUCH MAKE CONTACT OF COUNTER, COUNTER & PRIME WILL OP ONLY
- GRD BACK CONTACT OF PRIME COUNTER & ASSOCIATED COUNTER WILL OP.
- GRD 5' TO OP O COUNTER

DIST. E1 SWITCH
 3. AWAIT. SDE.
 4. BRUSH SELECTION
 5. AWAIT. SDE. (TRIP)
 6. GROUP SELECTION

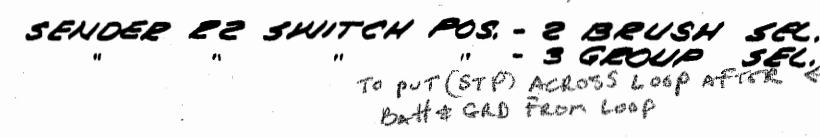


DISTRICT

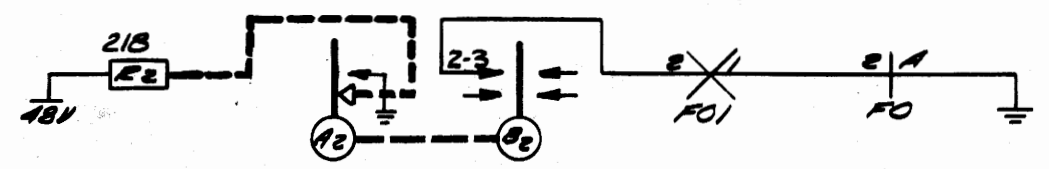
PLANT SCHOOL
 FOR TRAINING PURPOSES ONLY

DISTRICT BRUSH AND
 GROUP SELECTION

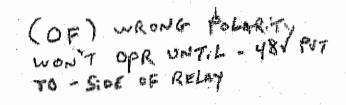
PANEL SYSTEM
 BATTERY CUT-OFF **OS-307**



- RL-1° DECODING Cmp
- SD° TIMING DELAY
- TW° 2ND IN DIFF BLDG (APPS TIMING)

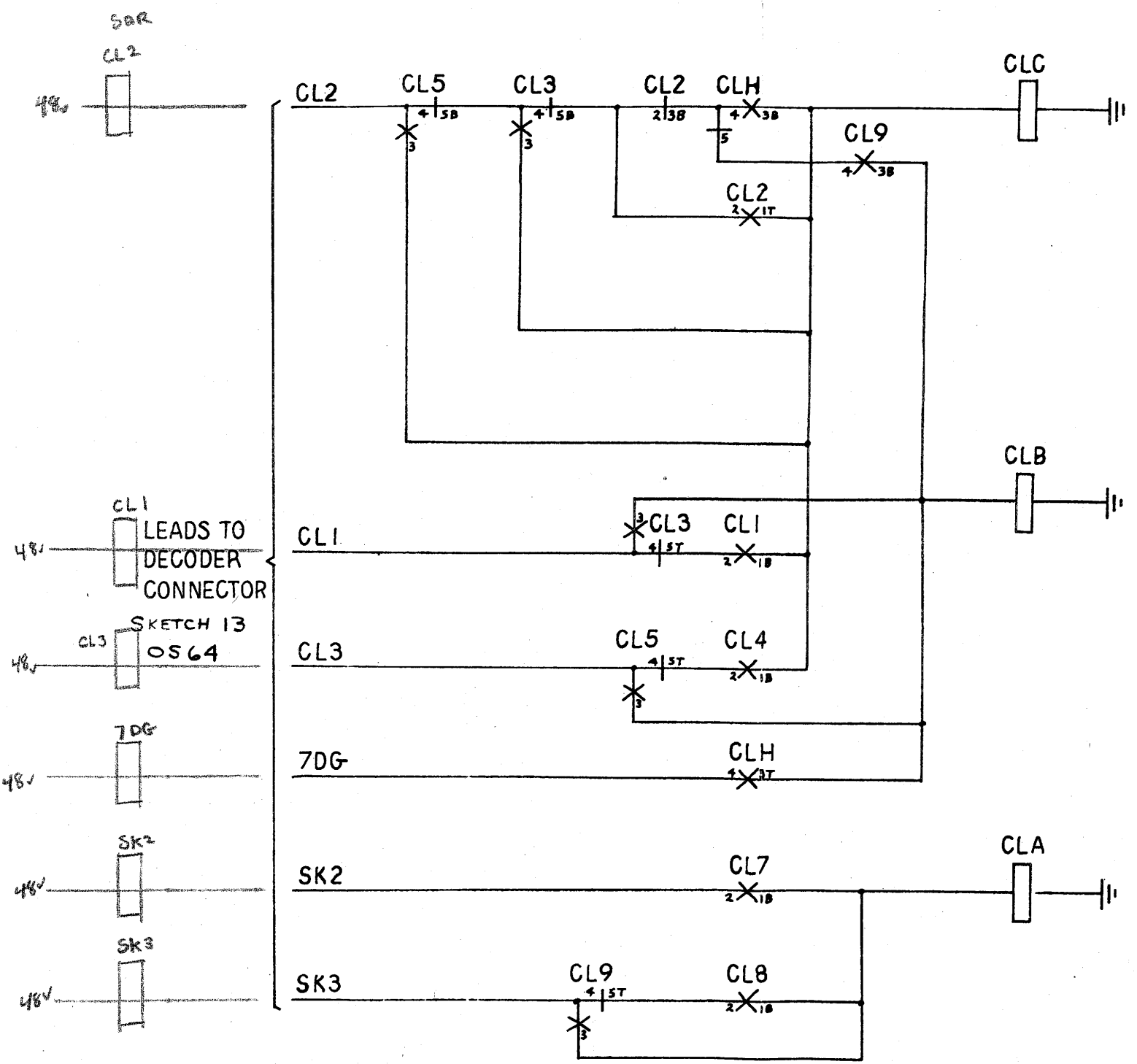
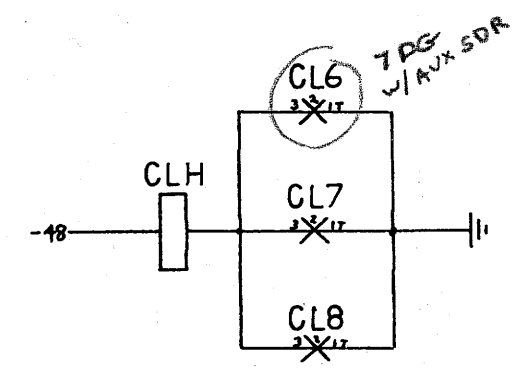
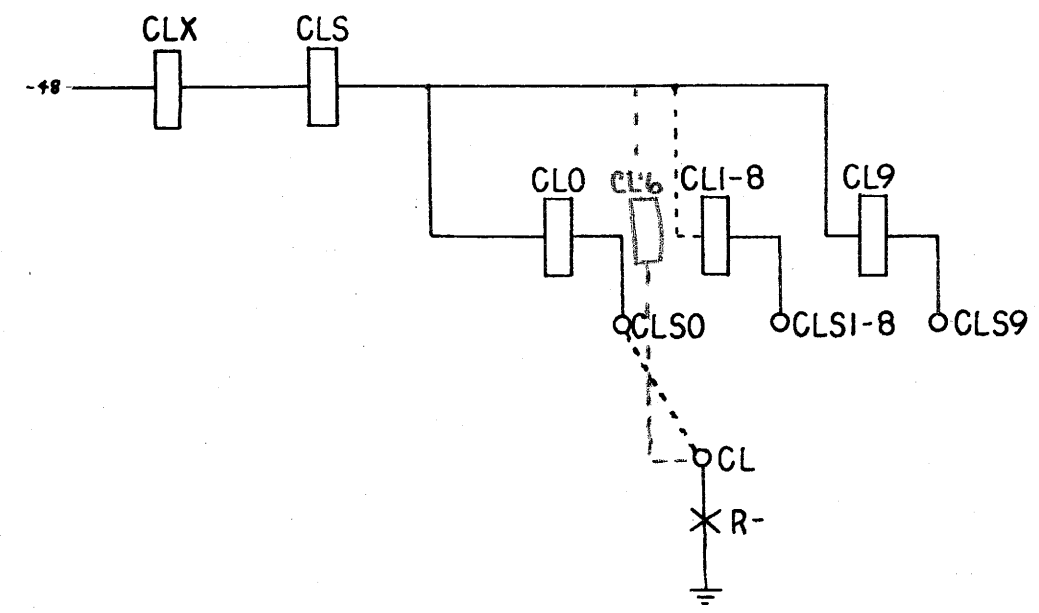


SEL	DB RELAY	SEL	DB RELAY
DB-0	NONE	DB 0	NONE
1	1	1	1
2	2	2	2
3	1-3	3	1-2
4	2-3	4	4
		5	3
		6	1-5
		7	2-5
		8	1-2-3
		9	4-5



SENDER

PANEL SYSTEM BATTERY CUT-OFF	OS-307
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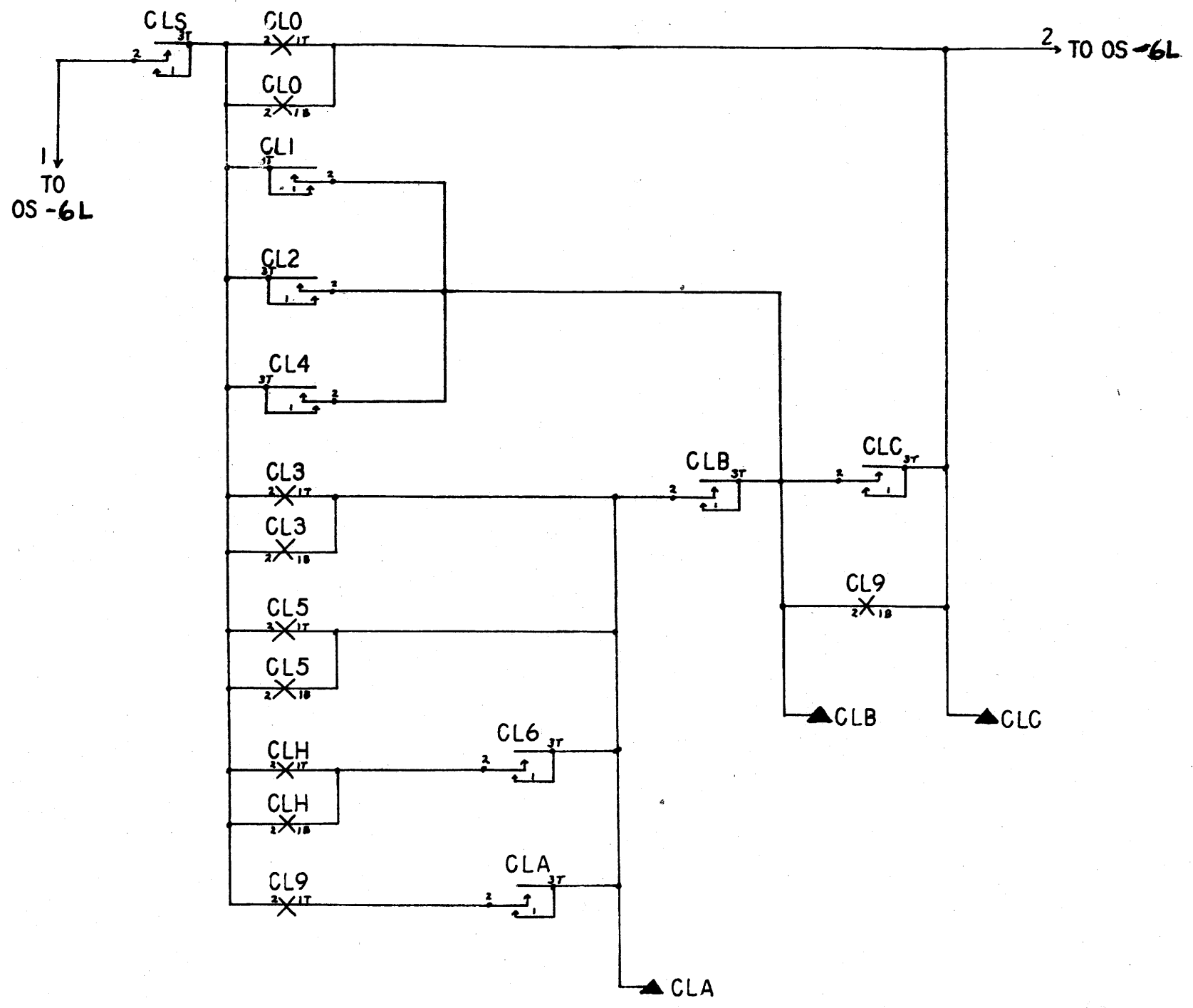


NOTE: CLO - NO CHECK RELAY OPER. OTHER CLASS RELAYS IDENTIFIED BY PATH OF CLA-CLB-CLC RELAYS. ASSOCIATE CLH WITH CLASSES 6,7,8.

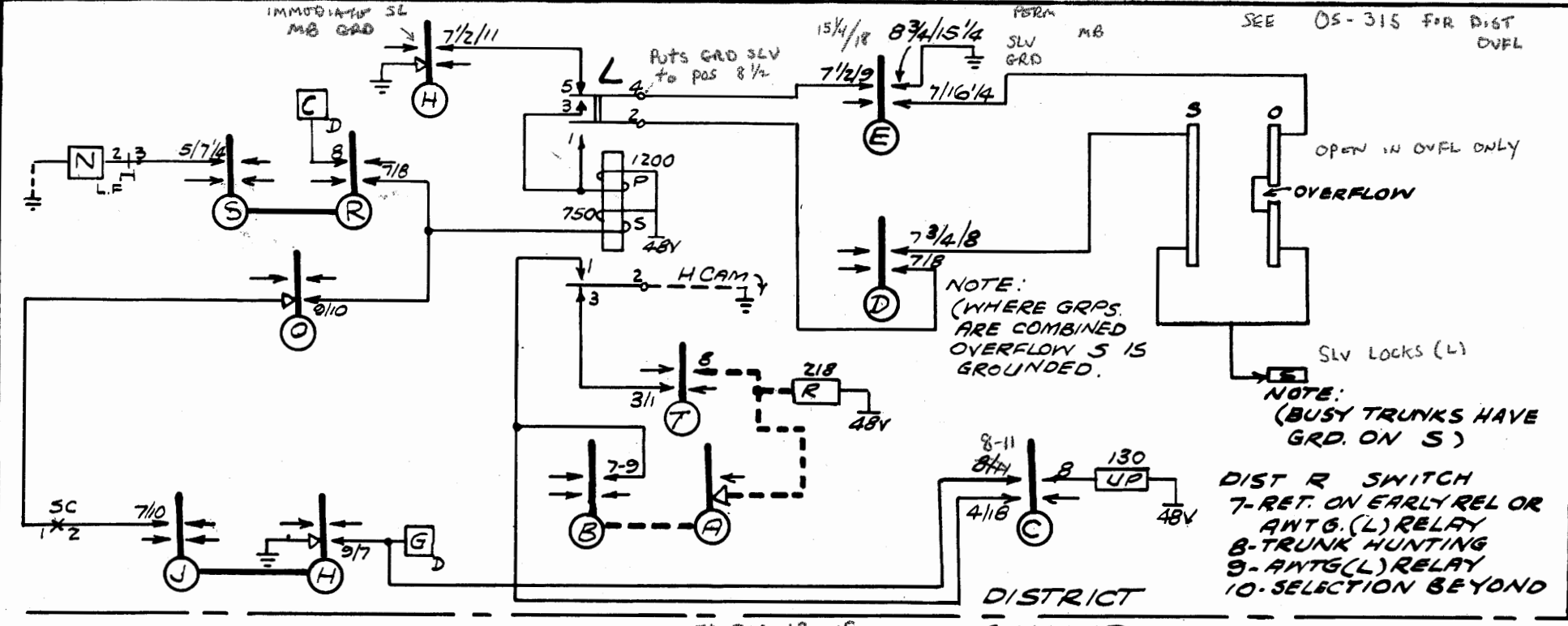
AD WIRING

PANEL SYSTEMS
DECODER
TRANSMITTING CLASS INFORMATION
DDD FEATURES OS-6N 11B

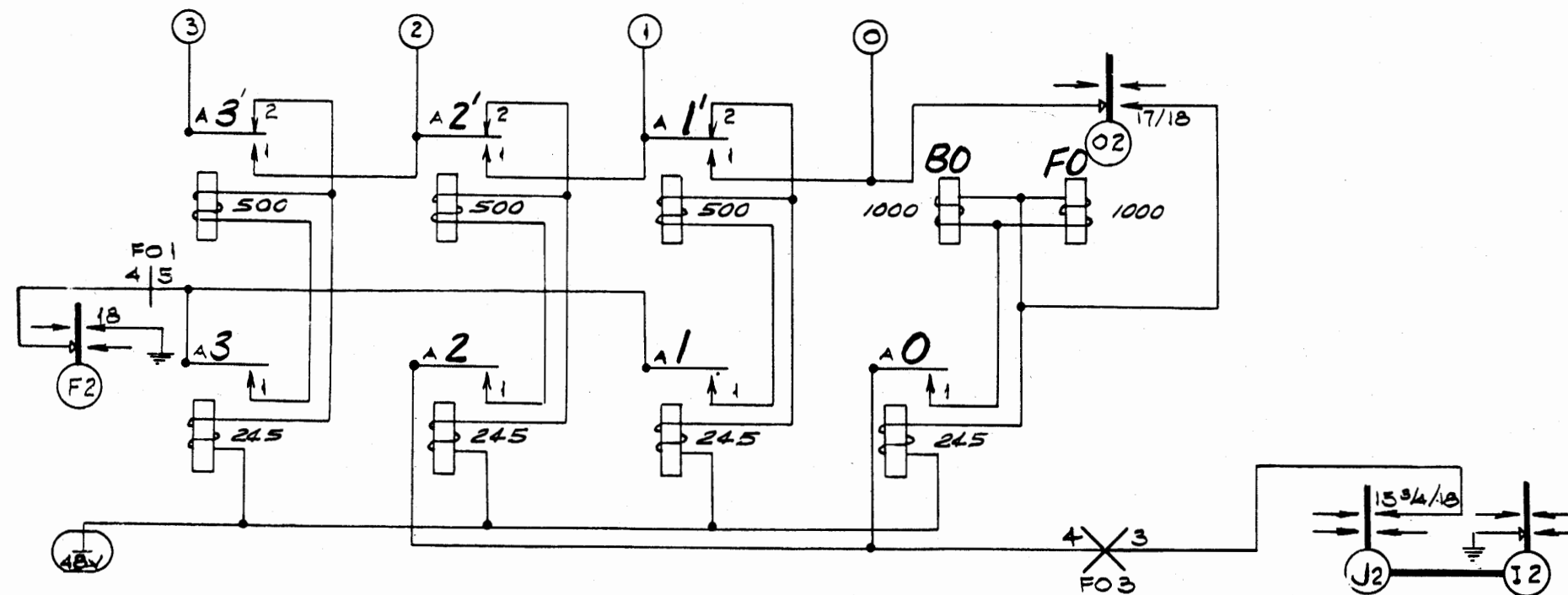
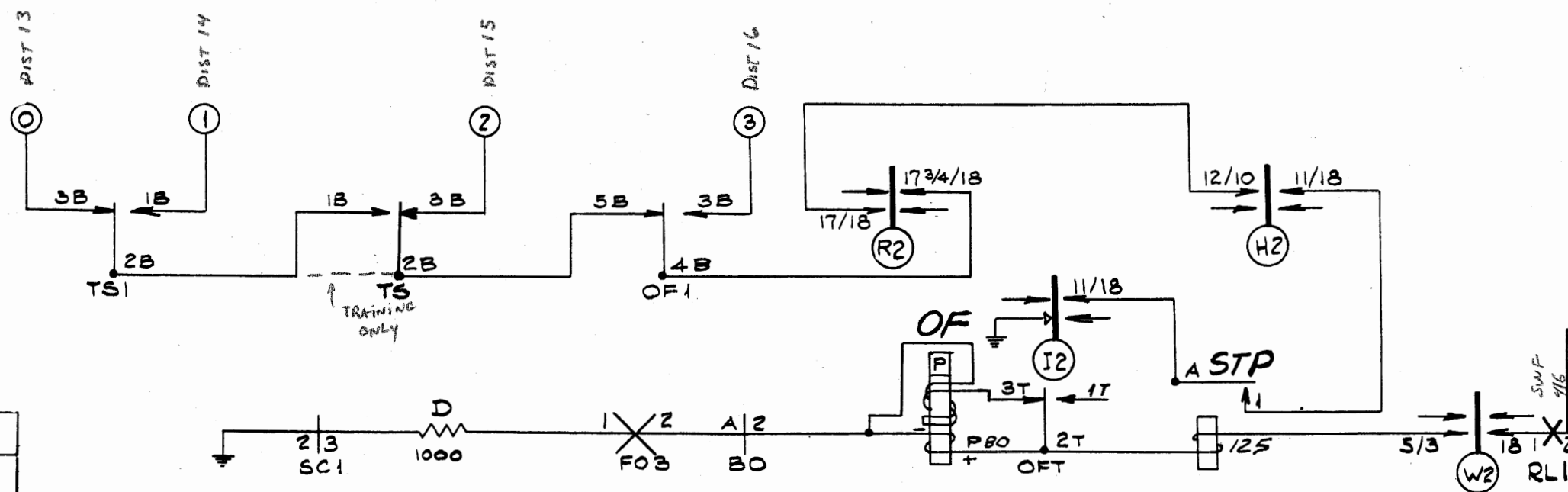
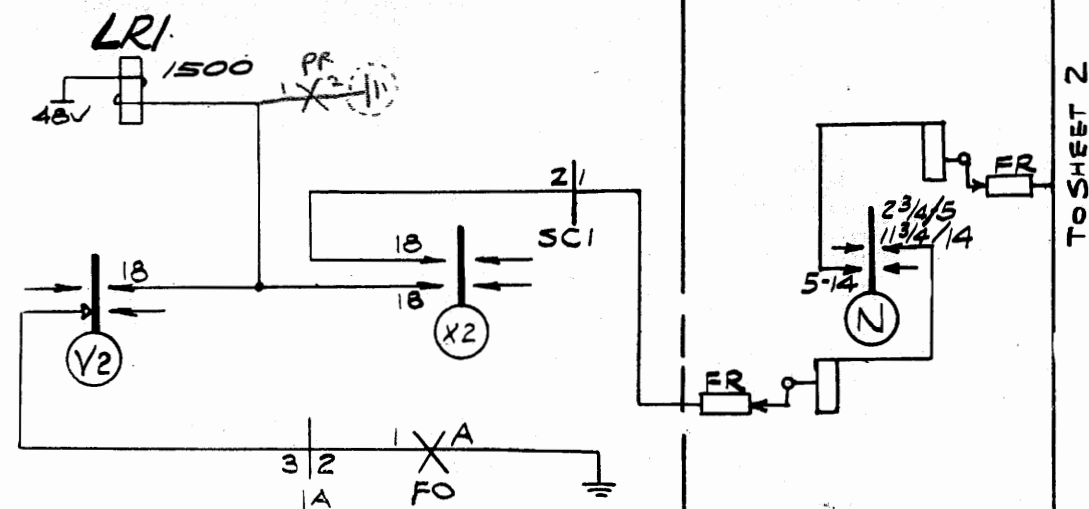
11c



PANEL SYSTEMS
DECODER
DDD FEATURES
OS-6P



SENDER

WILL BE USED TO
RELEASE LINKPLANT SCHOOL
FOR TRAINING PURPOSES ONLYTALK SELECTION AND
TRUNK CLOSUREPANEL SYSTEM
BATTERY CUT-OFF OS-310

SHEET 1 OF 2

TO SHEET 2

TO SHEET 2

LINK

NO TST CALL

GROUND OVER TIP OF AC CIRCUIT UNDER CONTROL OF LTD OR OPERATOR

FIN. IN POS 6³/₄ OPR'S (S) IN FINAL.

(TK) DROPS & DOES NOT HOLD TO OPR (S)

SWITCH ROLLS TO 12 IN FINAL & NO

TST IS MADE BY (C) IN POS 10¹/₄, ALLOWING FINAL

TO RIDE ONTO BUSY FINAL # SEE P. 26

(C) WILL NOT OPER IN
POS 7 AS IN NORMAL CALL.

X POS 6³/₄ 7

- TK
- S

X [R] 9

(C) FAILS TO OPER. IN POS 7 A/C TK RELEASING THEREFORE NO TEST
MADE OF TEL # SLV AS SW. PASSES 10¹/₄

X [R] 12

- C

X TK

X [R] 13

DISCONNECT P. 35

- TK

NO TEST EQUIP PUTS BATT TO SLV

X [R] 16

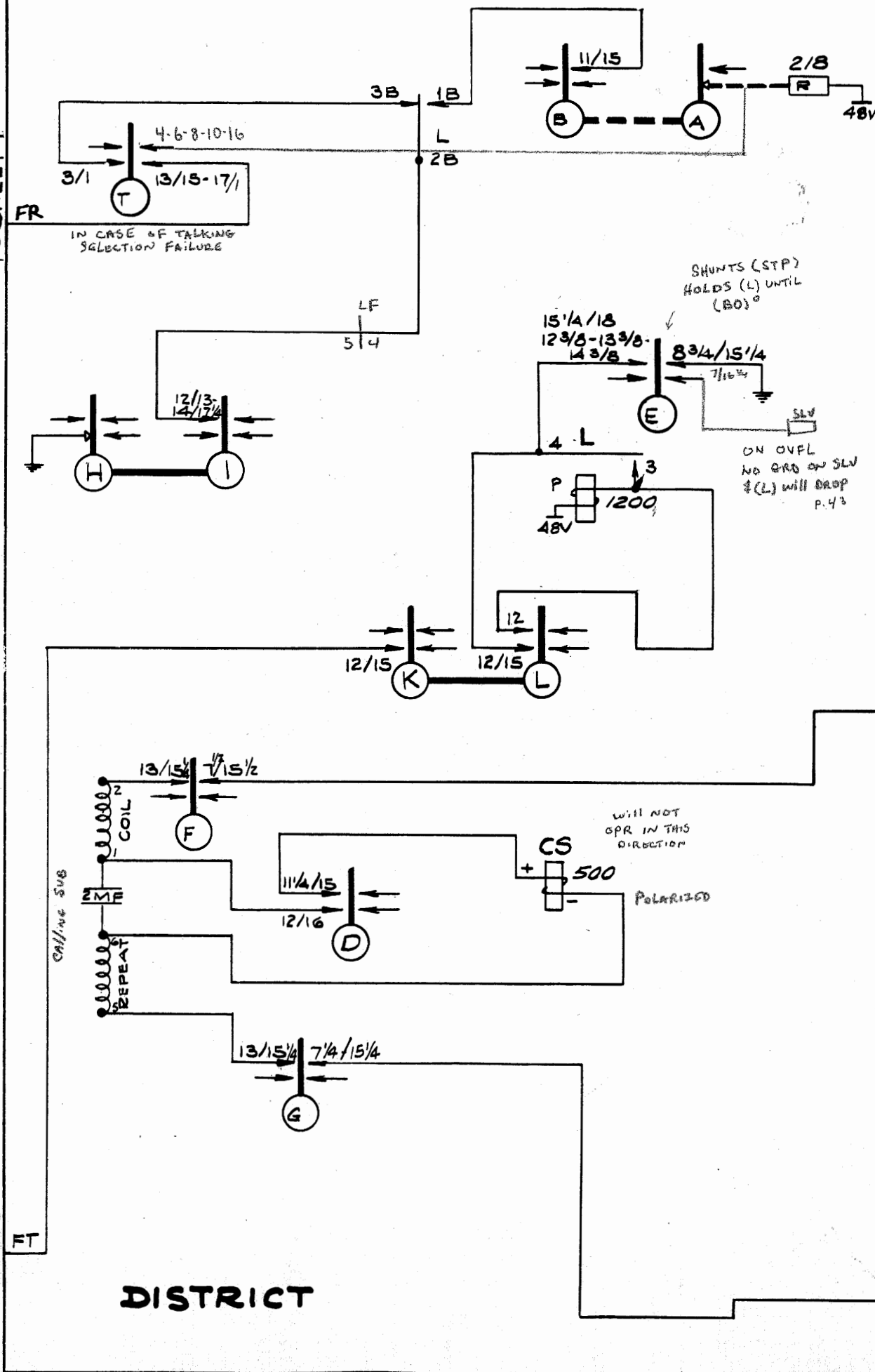
WITH S° AS SWITCH PASSES POS 15¹/₄ (C) WILL NOT OPER P. 35

X S

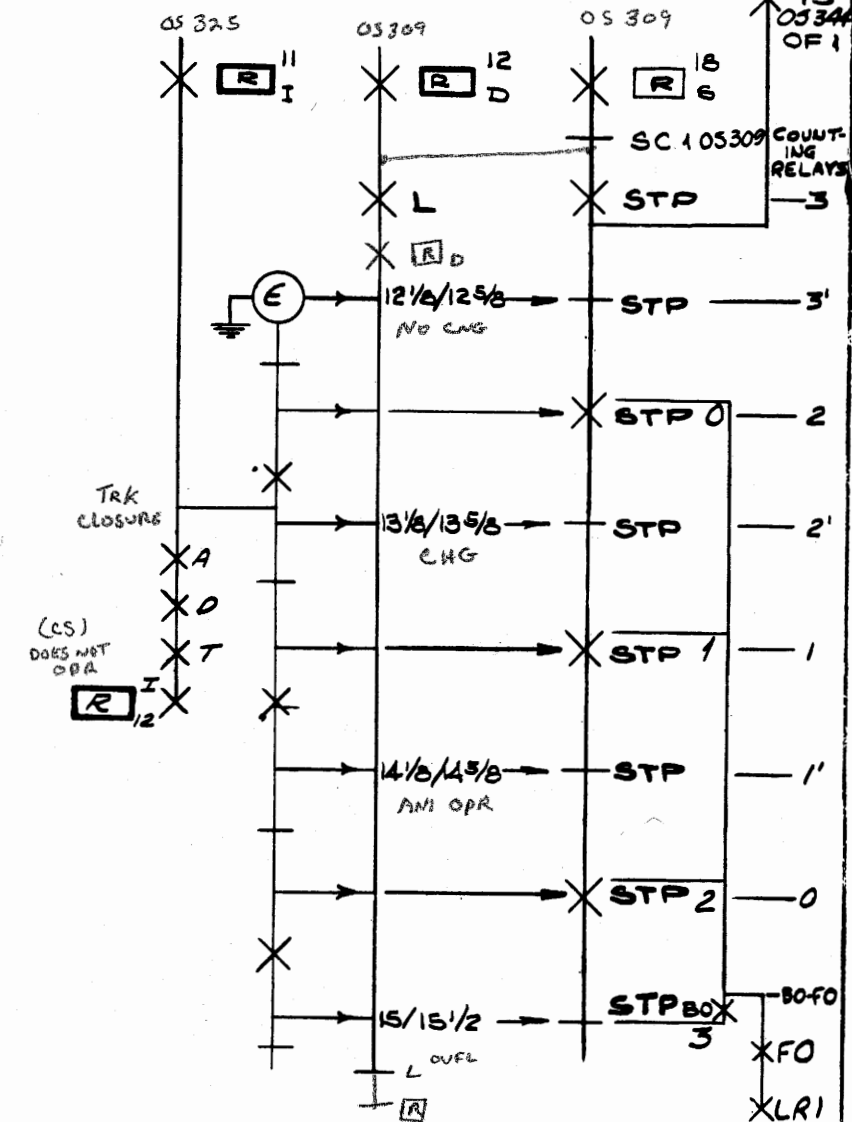
ISSUE
7-11-49

TO SHEET 1

TO SHEET 1



SEQUENCE CHART



TALK SEL.	SW POS.	E CAM PULSING	SEND RELAYS
NC 0	13	12/13/12 1/2	TS
CHARGE 1	14	13/13/13 1/2	TS-TS1
OPR 2	15	14/13/14 1/2	NONE
OVFL 3	16	15/15/15 1/4	OF 1

RINGING SHEET 30
DIST ADV FOR T SEE # 27

S.D. 21115-011 INCOMING CCT.
S.D. 21077-011 LINE FINDER & DIST. CCT.
S.D. 21193-011-012-013 SUBS. SDR. CCT.

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

TALK SELECTION AND
TRUNK CLOSURE

PANEL SYSTEM
BATTERY CUT-OFF

OS-310

SHEET 2 OF 2


$$\frac{132.5}{165.00}$$

DIST.

SEQUENCE CHART

34

OS-311
OS-348
PG 33

OS-309 # 27

OS-310

X S OS-311

X R 13-14 X CS

S NOTE 1.

F1 DISC 0.402 SEC.

F1 DISC .02 SEC.

F1/F2 DISC .200 SEC.

F2 DISC

Rel's (CO) OPENS T & R TO CALLING PARTY

X R 12/16

SC X 16/16 1/4
TST INT FOR FALSE GRD. OR BRIDGED CONTACTS

115W Batt. on H Lead to Opr. Mess. Req. 15/17

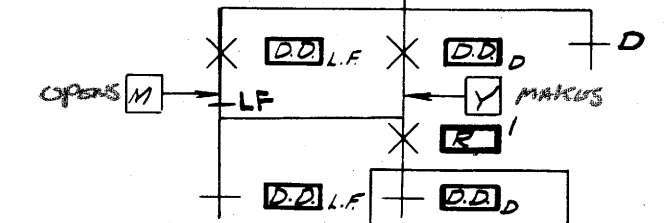
POS 16 #31

X R 17 X CS

X F1/F2 DISC

X LF

X R 18

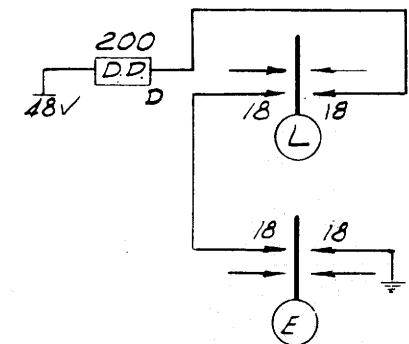
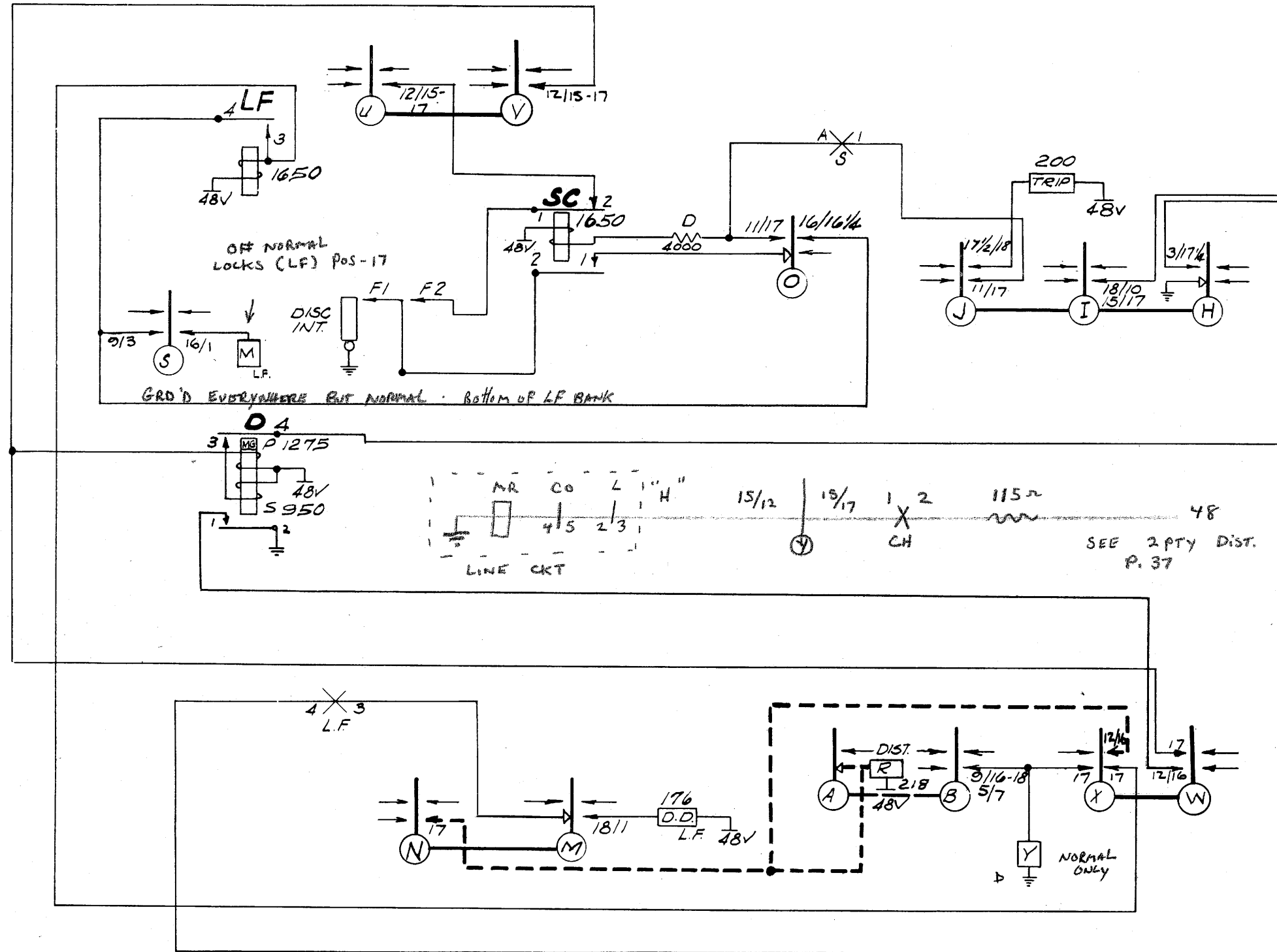


270 Batt. on TR Lead to Link
Grd. ST Lead to Link
OS-314

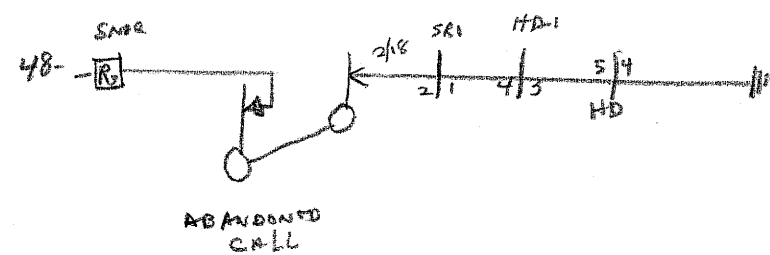
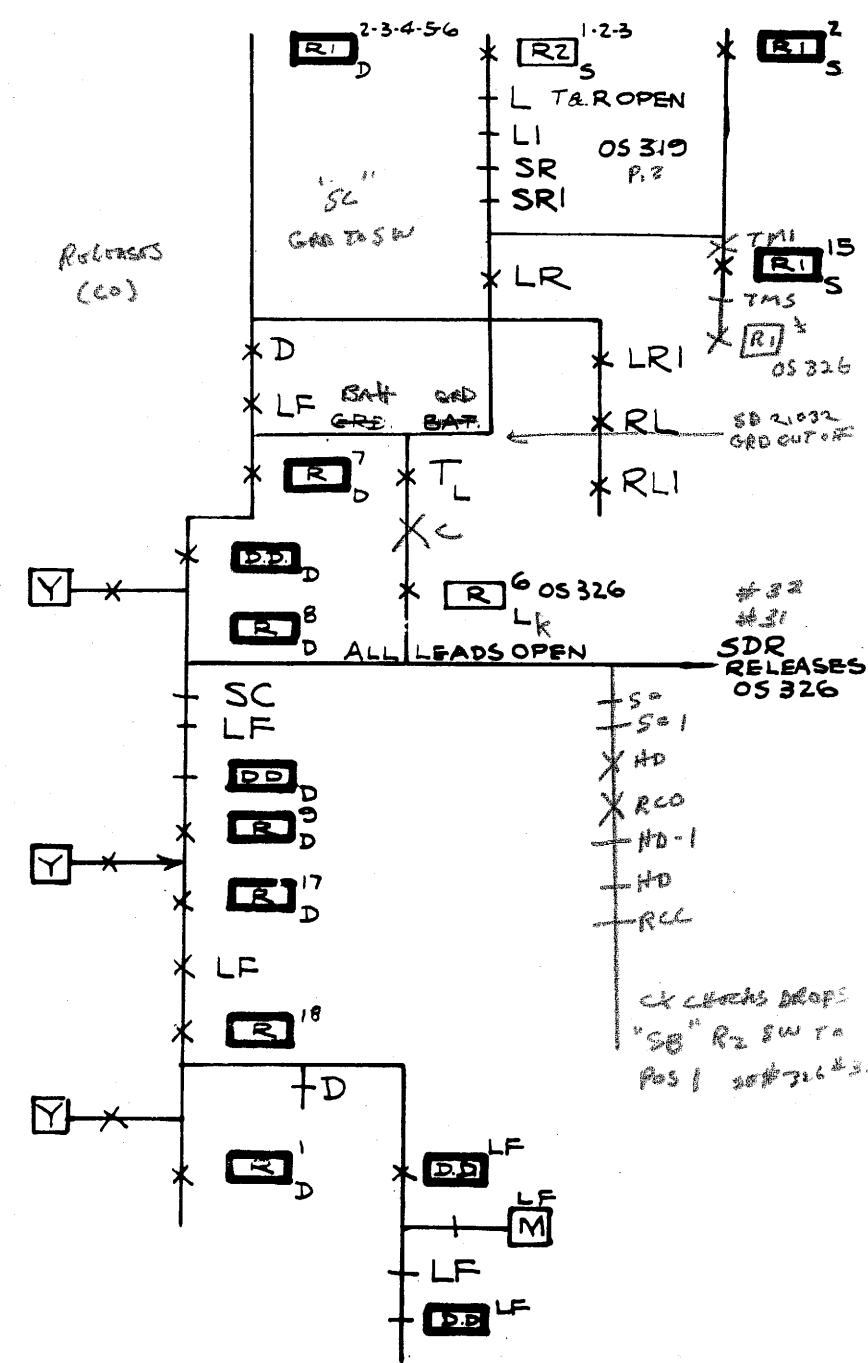
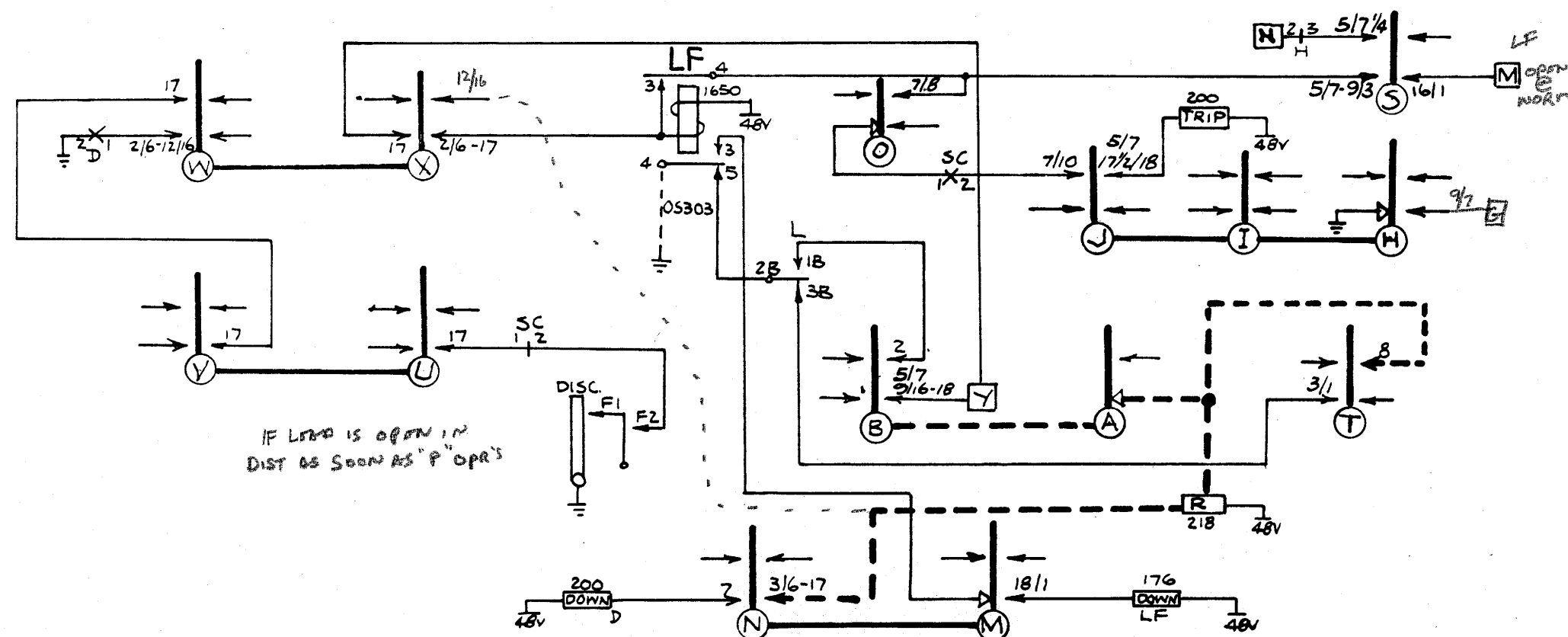
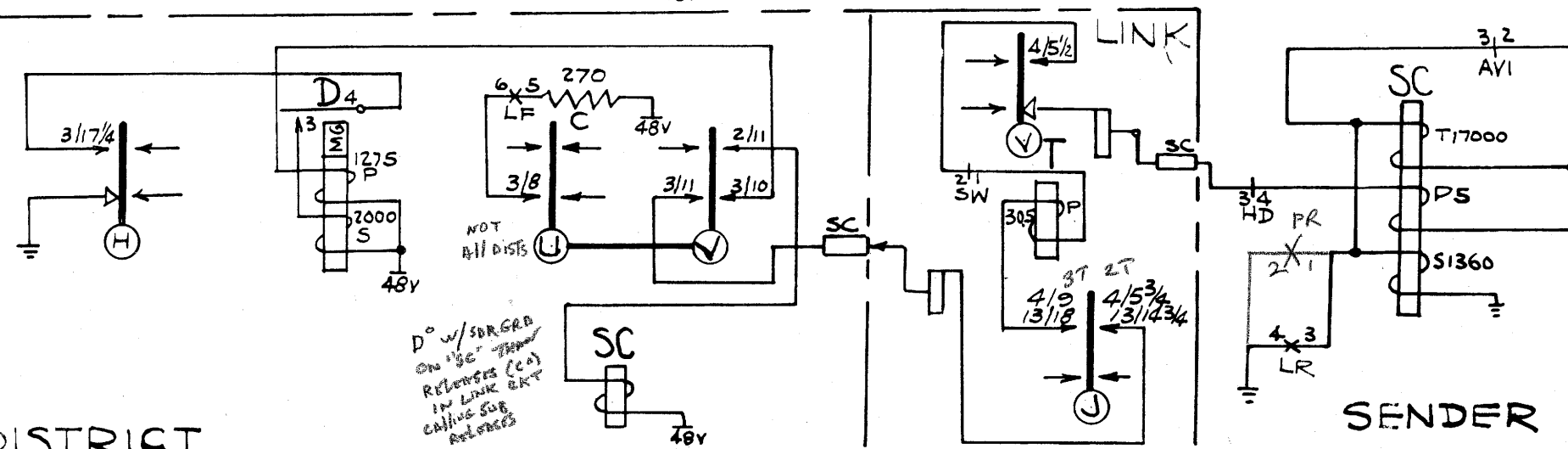
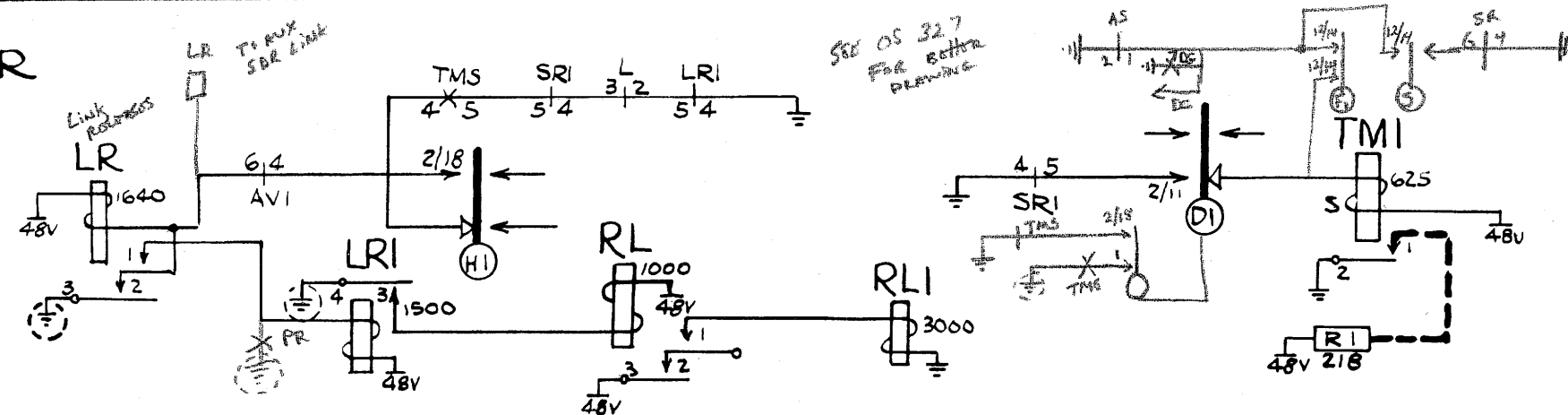
NOTE
1. "S" RELAY RELEASES WHEN CALLING SUB. DISCONNECTS.

(SC) WITH F1 OPENS
(D) WHEN F2 MAKES

S.D. 21077-011 LINE, FIND, & DIST. C.T.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
RELEASE OF DISTRICT
CHARGE CALL
PANEL SYSTEM
BATTERY CUT-OFF
OS-312



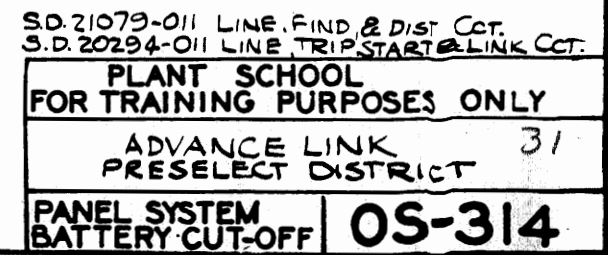
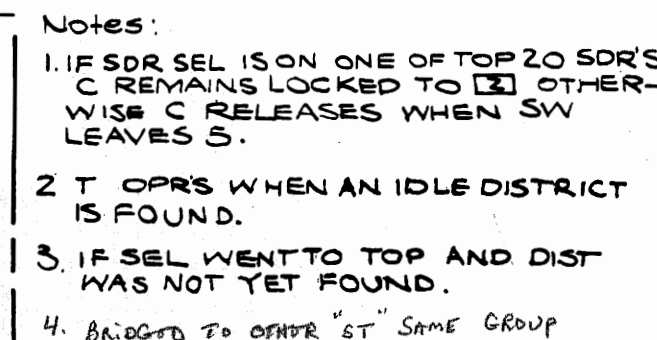
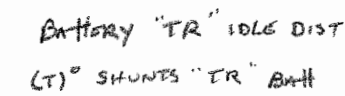
Dist Pos.
14 - CHG
15 - AWAIT OPR
16 - TACK
17 - OVFL
18 - RETURN
MR CHARGE PERIOD



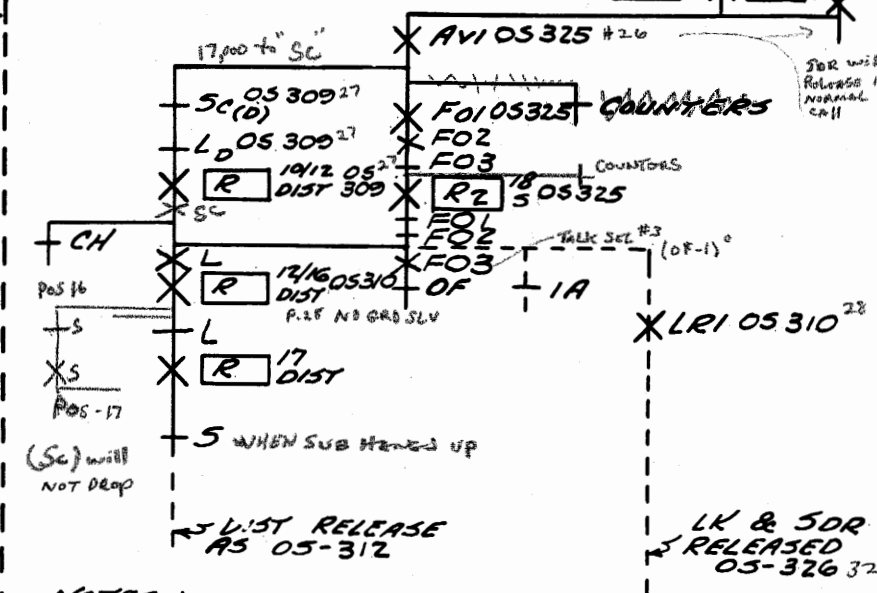
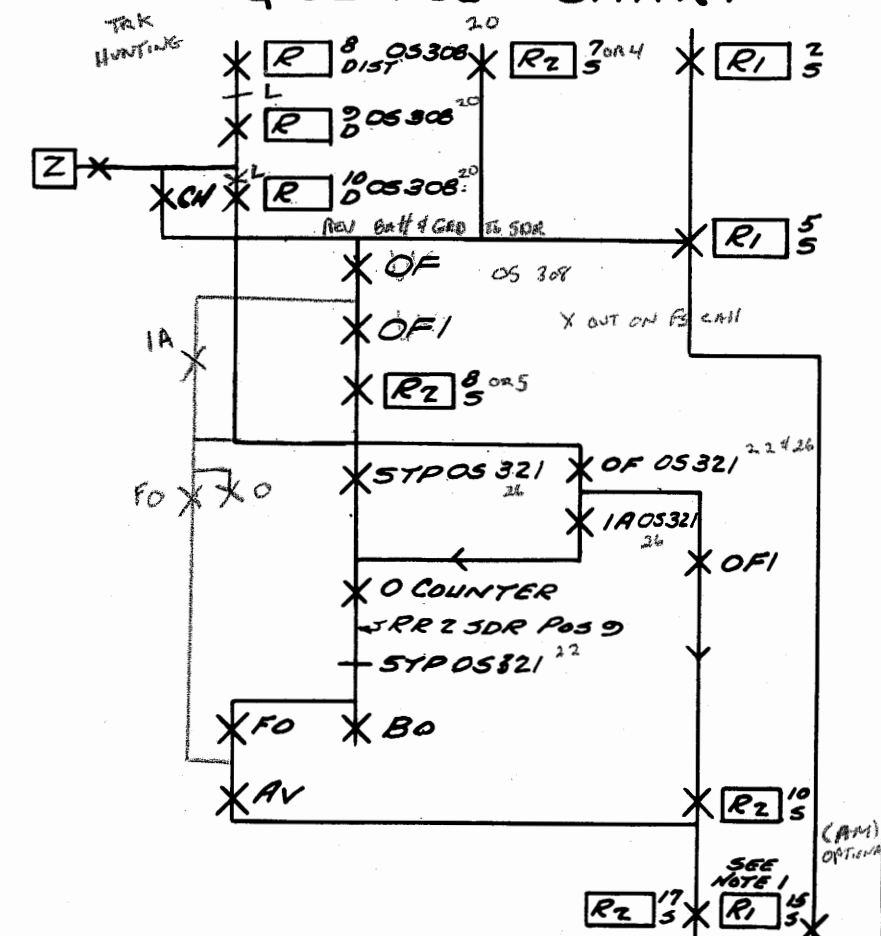
S.D. 21193-011-012-013 SUBS. SDR. CCT.
S.D. 21077-011 LINE FIND & DIST CCT.

S.D. 21077-011 LINE FIND & DIST COT.

PLANT SCHOOL FOR TRAINING PURPOSES ONLY	
EARLY RELEASE DIST. POS. 2/6 SPR. POS 1/3 4/2	
PANEL SYSTEM BATTERY CUT-OFF	05-313



SEQUENCE CHART 43



NOTES ÷
1. WHEN DAILING IS COMP.
R1 IS ADV TO POS 15
UNLESS AM OPTION

S.D. 21077-011 LINE, F/ND, & DIST GCT

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

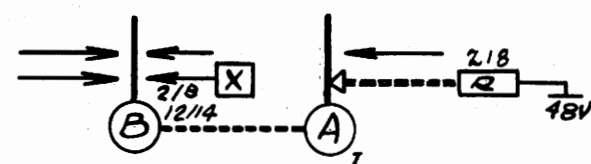
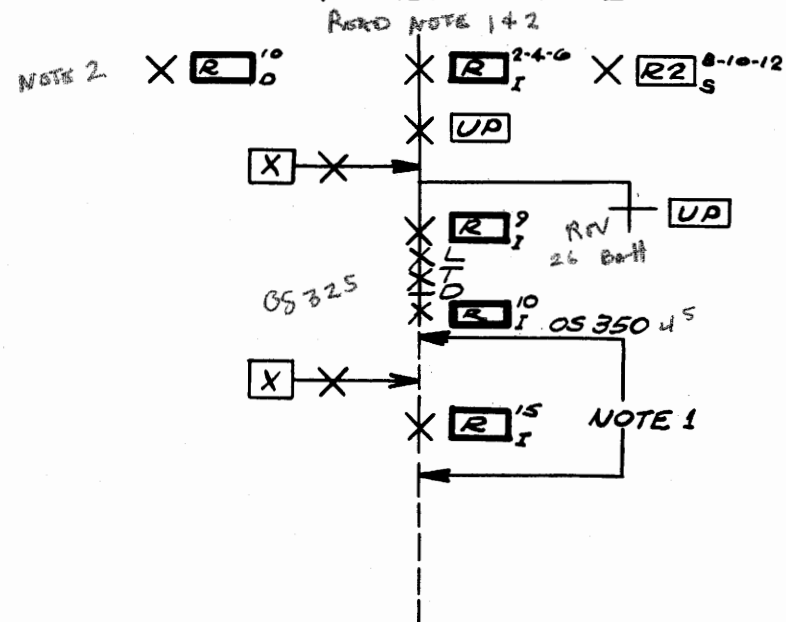
DISTRICT OVERFLOW ON FULL MECHANICAL OR PCI CALL 43

PANEL SYSTEM BATTERY CUT-OFF	OS-315
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INCOMING TELL-TALE

DISTRICT TELL-TALE

44



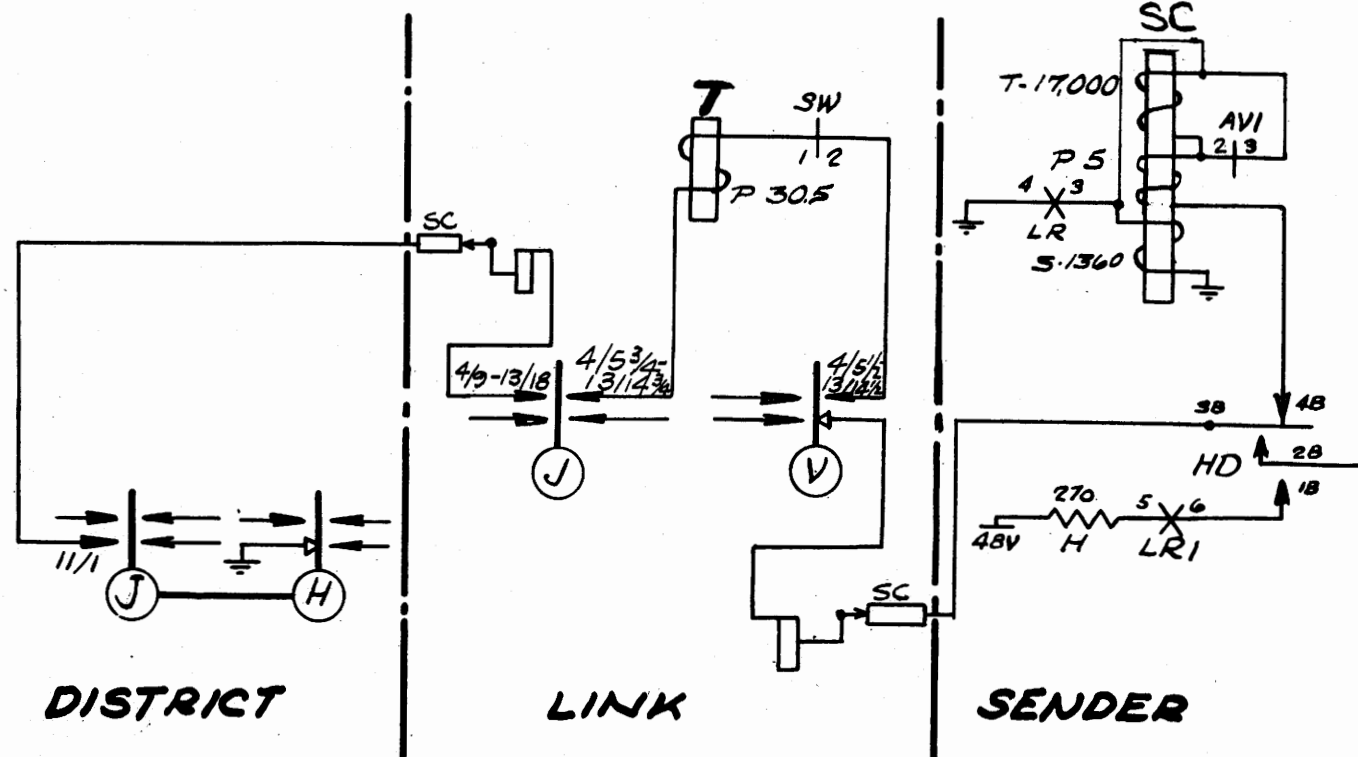
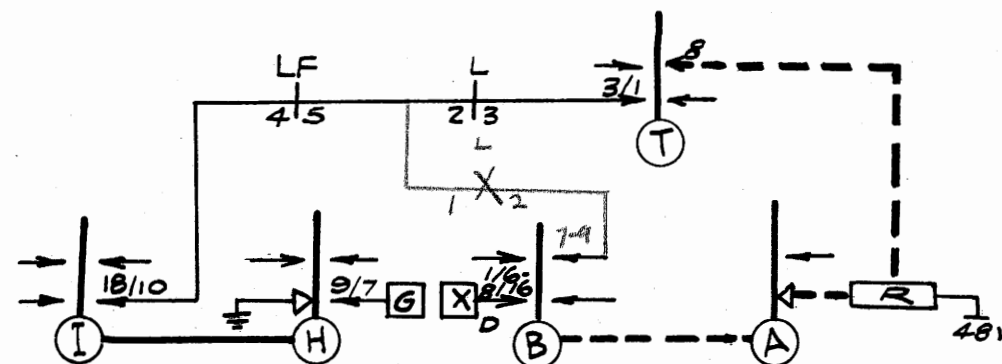
NOTE:

1. WHEN X ADVANCES INC. TO POS. 9, OPERATIONS IN SDR, INC. & DISTRICT ARE THE SAME AS OS-350 (INC. OVFL.) EXCEPT X ADV. SW. 12/15. # 45

2. INC GOES TO π DUE TO NO COUNT DOWN W/ (LR) IN SDR OPR.

SEE OS-313 FOR (LR) OPER ON ABANDONED CALL OS-330

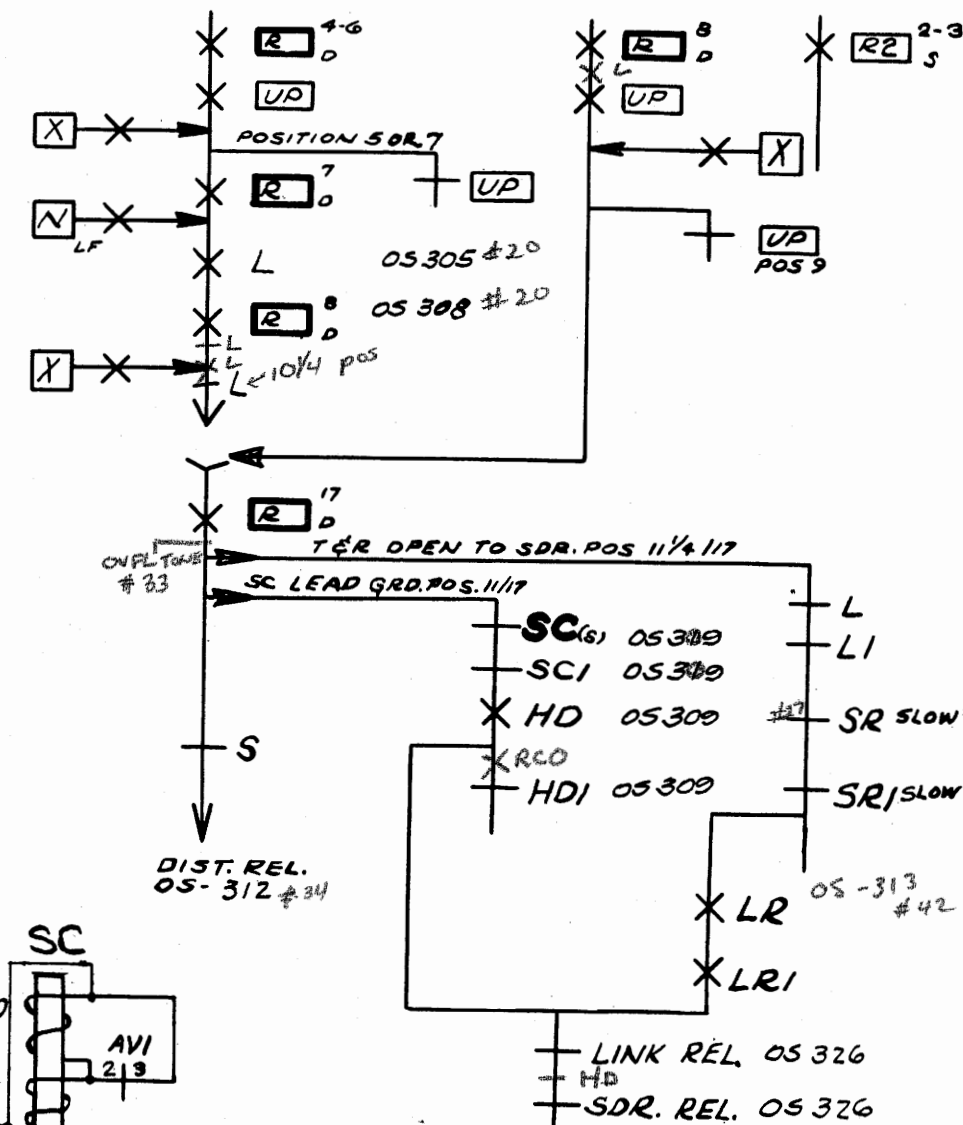
SEE OS 321 FOR (LR) OPENING COUNTING RELAY PATH



DISTRICT

LINK

SENDER



SEE P. 42 FOR R2 PATH TO ROTATE R2 SWITCH TO NORMAL

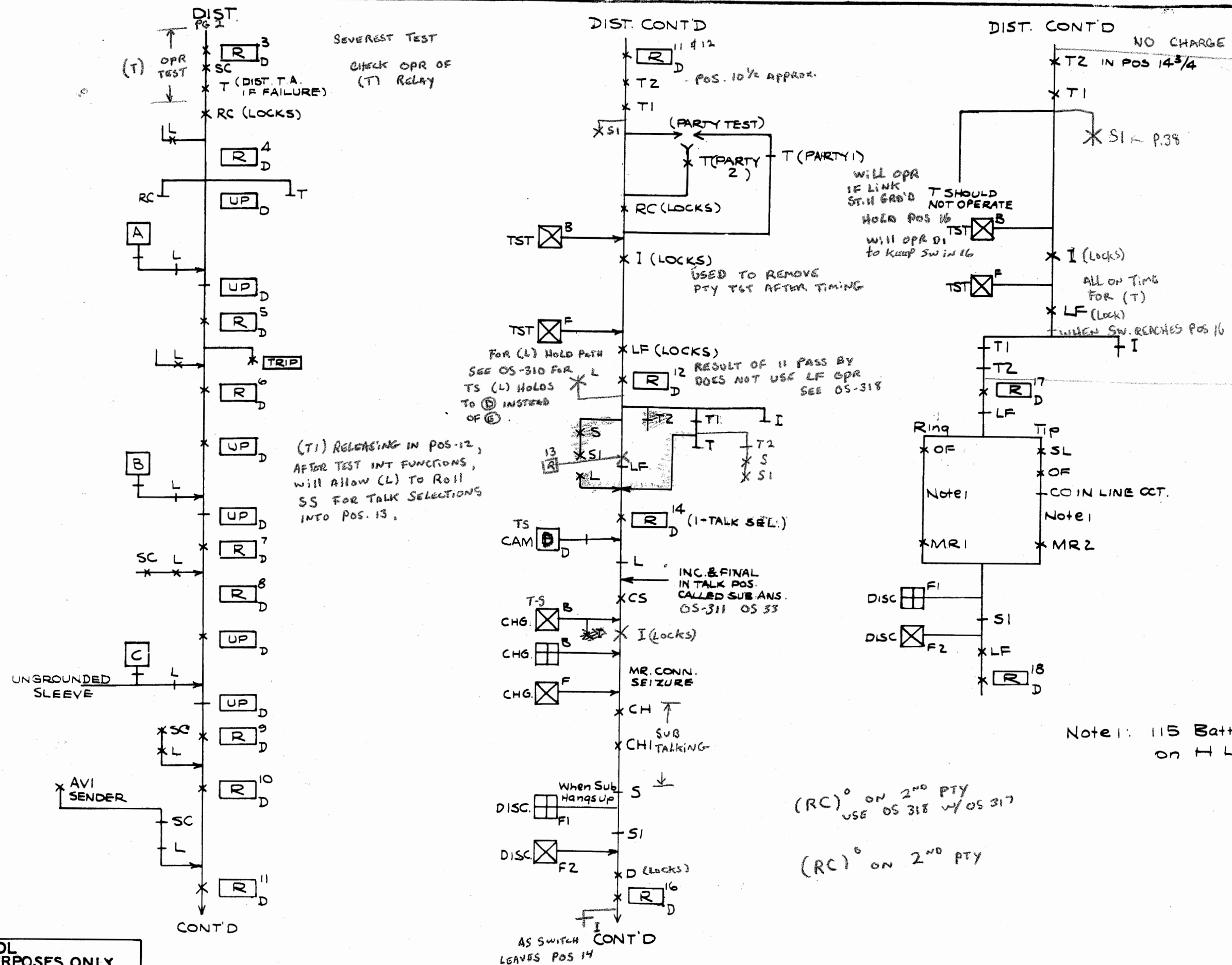
S.D. 21077-011 LINE, FIND & DIST CCT.
S.D. 21115-011 INCOMING CCT.

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

DISTRICT TELL-TALE 44
INCOMING TELL-TALE

PANEL SYSTEM
BATTERY CUT-OFF OS-316

ISSUE #
OCT. 18, 1949

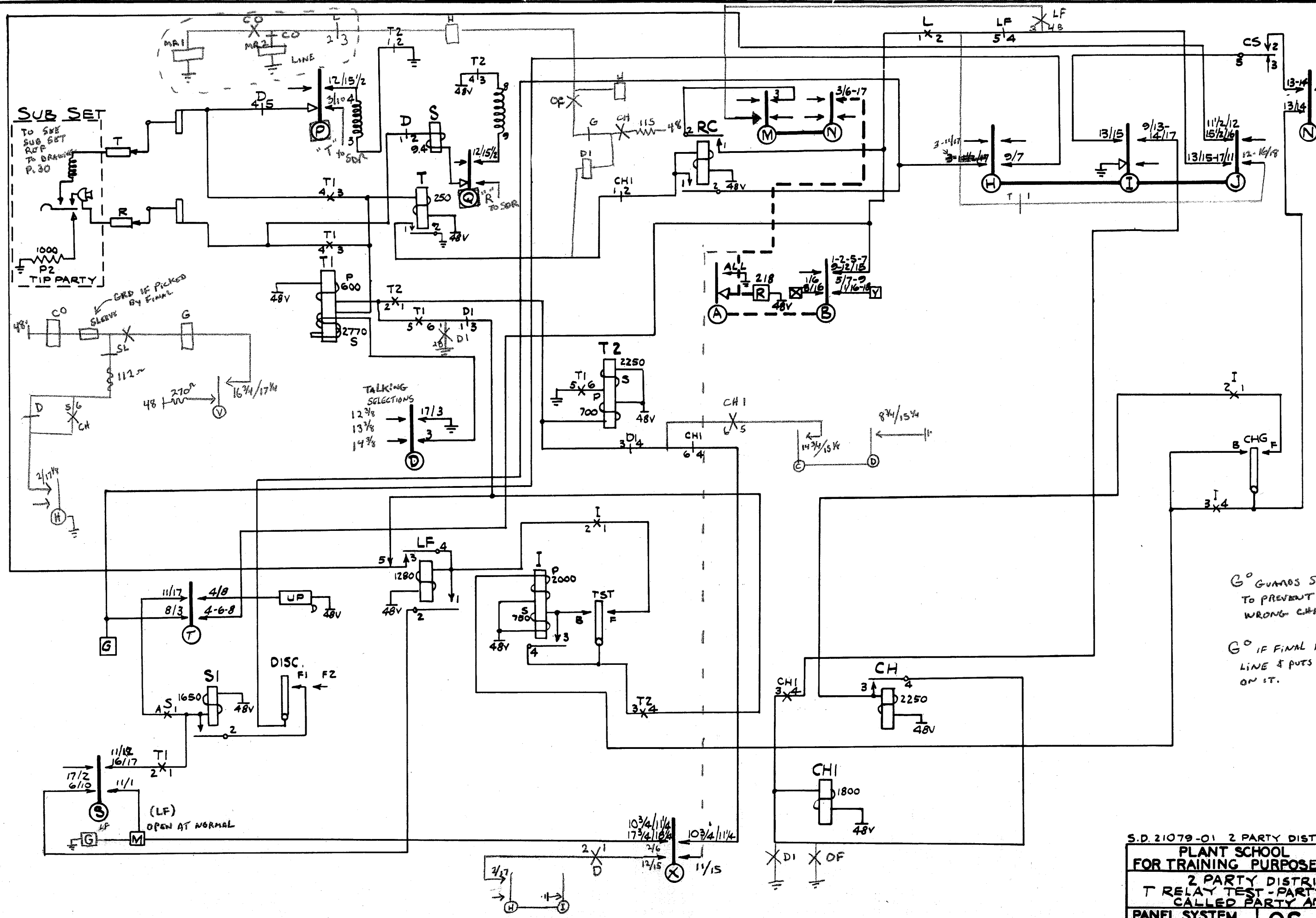


PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

2 PARTY DISTRICT
SEQUENCE CHART 37

PANEL SYSTEM
BATTERY CUT-OFF OS-317

Sheet 1 of 2



G° GUARDS SLV
TO PREVENT
WRONG CHARGE,
G° IF FINAL PICKS
LINE & PUTS GRD
ON IT.

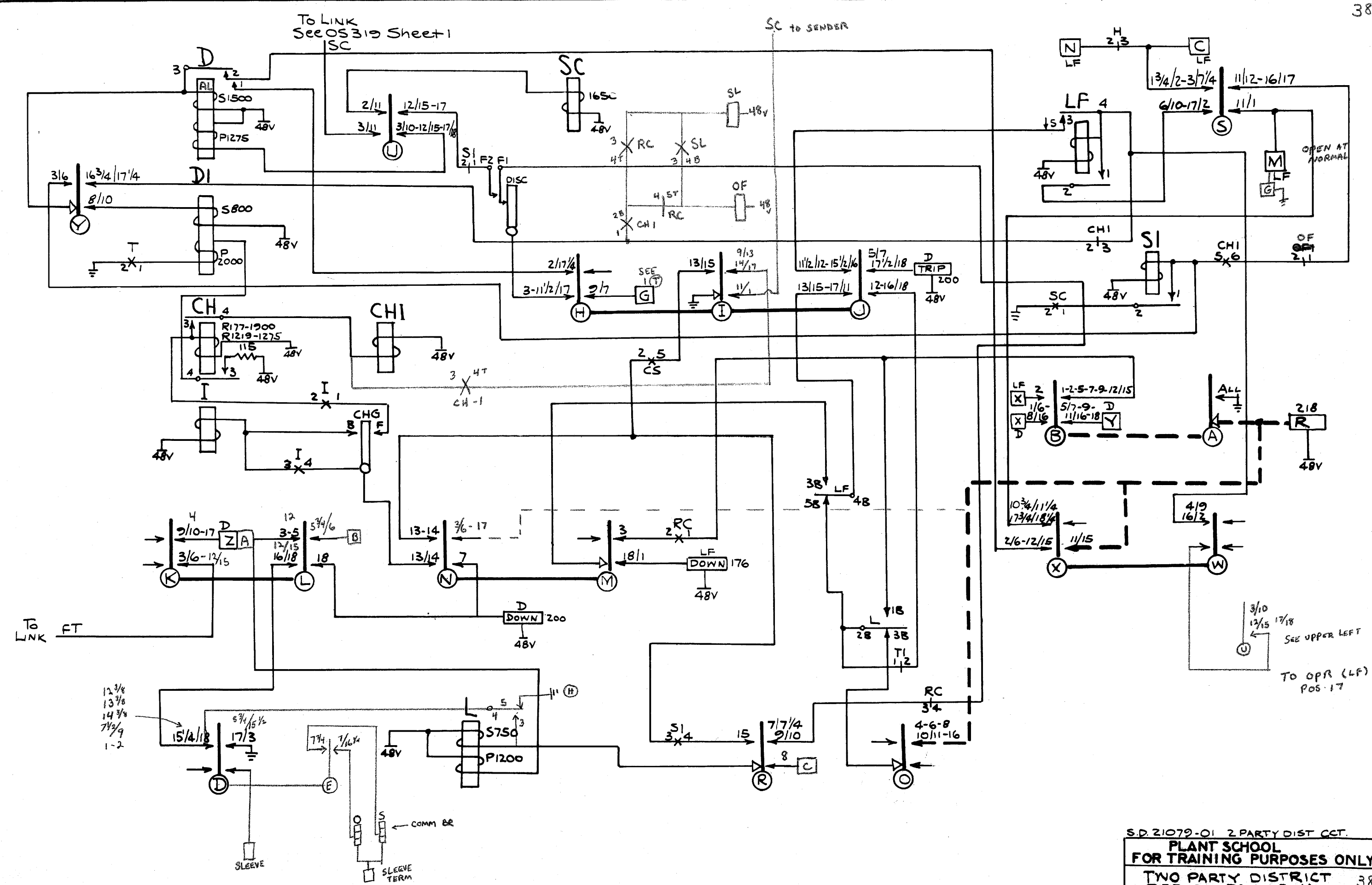
S.D. 21079-01 2 PARTY DIST. CCT.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
2 PARTY DISTRICT 37
T RELAY TEST - PARTY TEST
CALLED PARTY ANSWER
PANEL SYSTEM BATTERY CUT-OFF OS-317

Hand-drawn schematic diagram of a control system for a steam turbine. The diagram shows a vertical line with various components connected to it. At the top, a 'DISC' box with 'F1' is connected to 'S (SUBS DISC.)'. Below it, another 'DISC' box with 'F2' is connected to 'SI'. Further down, a 'TST' box with 'B' is connected to 'T1 (2ND LINE TEST)'. A 'TST' box with 'F' is connected to 'I'. A 'NOTE 1' points to 'T1 (2ND LINE TEST)'. Below that, a 'DISC' box with 'F1' is connected to 'OF', which has an arrow pointing to 'BAT TO OPR. MR'. Another 'DISC' box with 'F2' is connected to 'SI'. A 'SAME AS OS-317' points to 'LF'. Below that, a 'DOWN' box with 'D' is connected to 'LF'. A 'TRIP' box with 'D' is connected to 'LF'. A 'CH' box is connected to 'CHI'. At the bottom, a 'DOWN' box with 'D' is connected to 'TRIP'.

WILL CAUSE
DIST TIME ALARM

PANEL SYSTEM BATTERY CUT-OFF	05-318
---------------------------------	--------

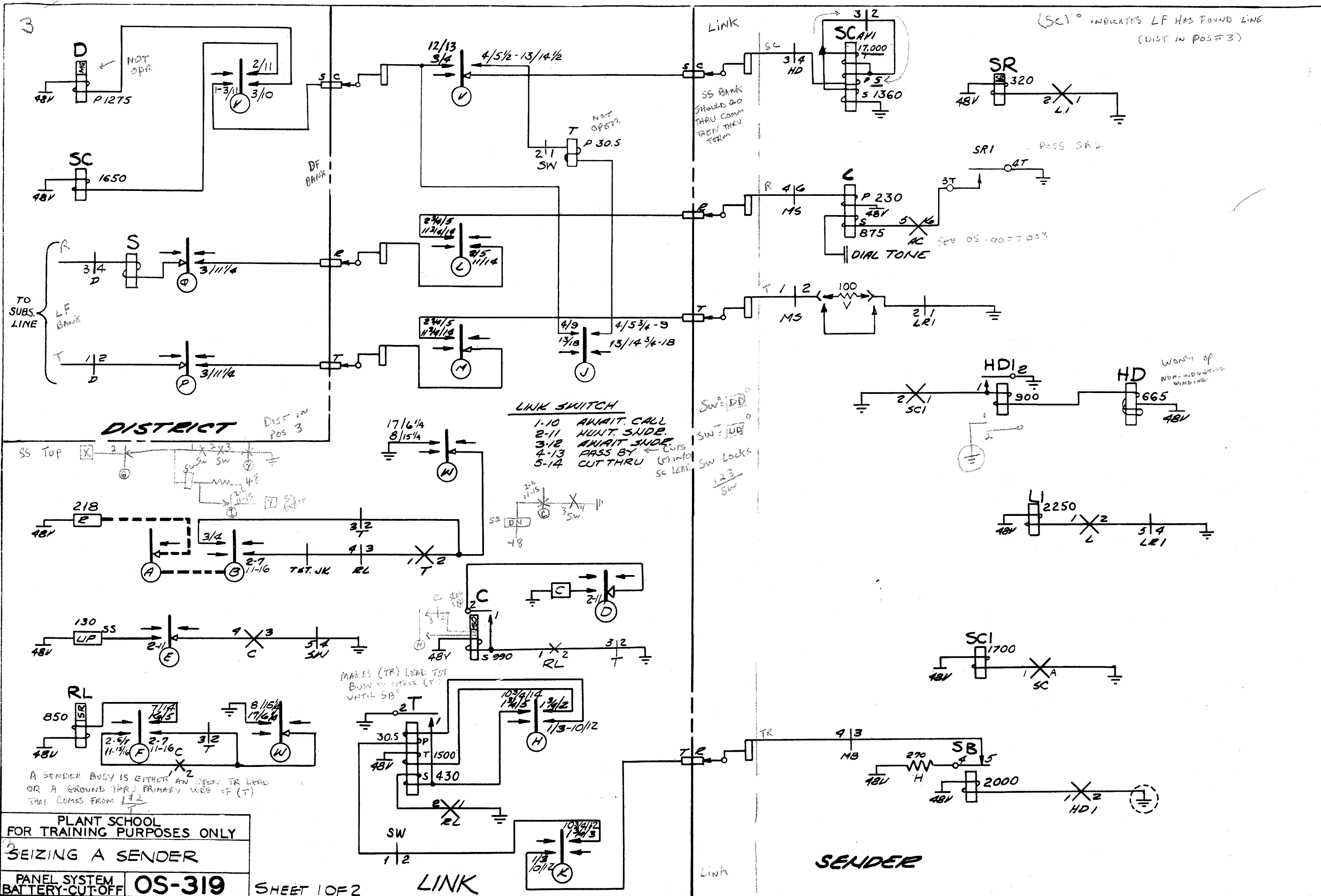
SHEET 1 OF 2

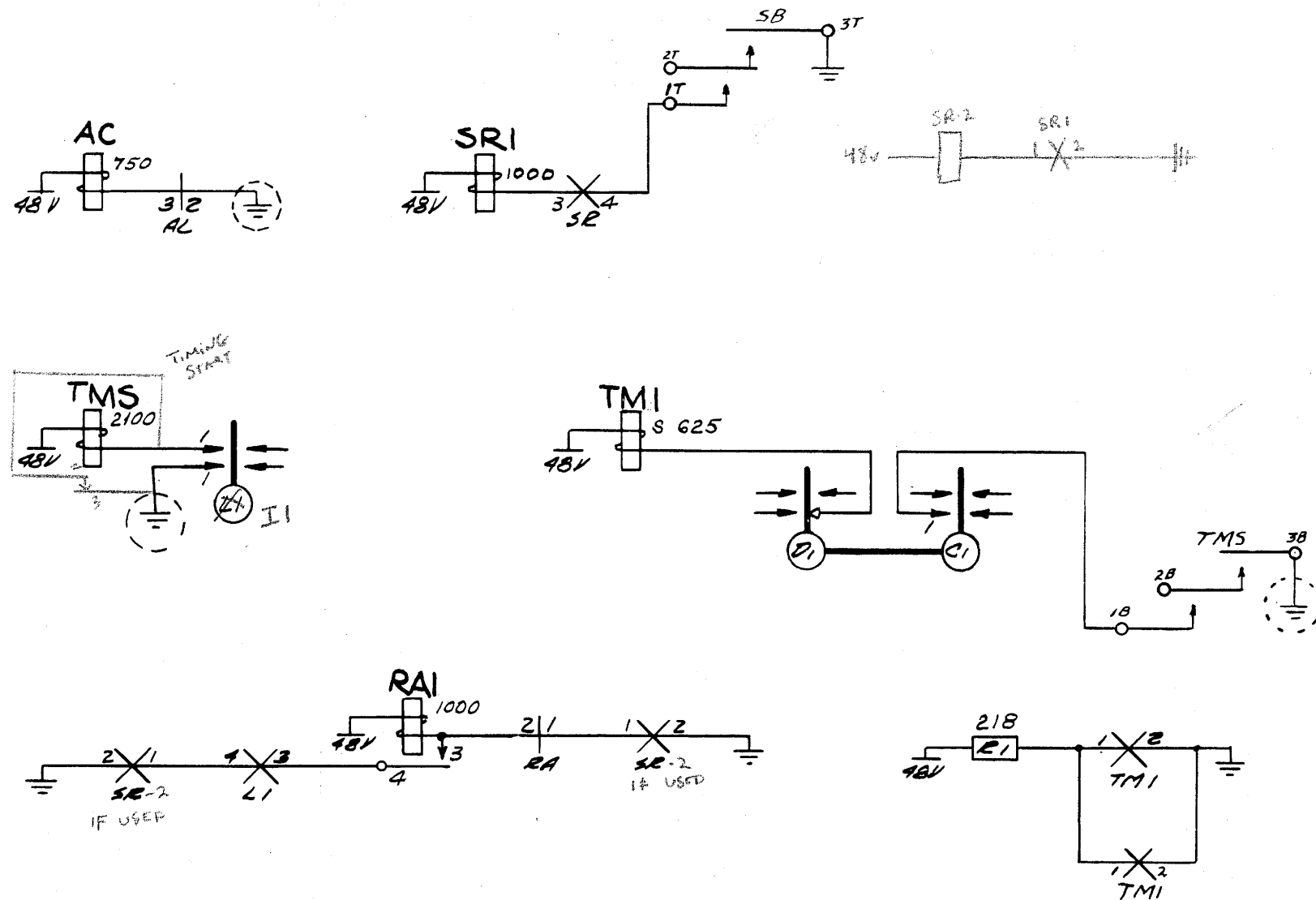


LINE FINDER FRAME 400 TERMINALS

399	A	B	360
360	BANK 9		399
359	A	P	320
320	BANK 8		359
319	A	B	280
280	BANK 7		319
279	A	B	240
240	BANK 6		279
239	A	B	200
200	BANK 5		239
199	A	B	160
160	BANK 4		199
159	A	B	120
120	BANK 3		159
119	A	B	80
80	BANK 2		119
79	A	B	40
40	BANK 1		79
39	A	B	0
0	BANK 0		39

3



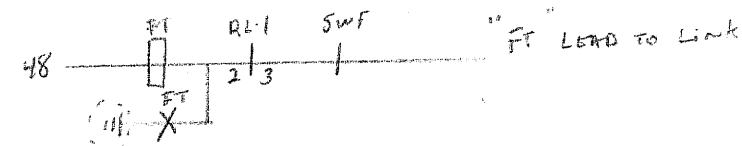


SENDER

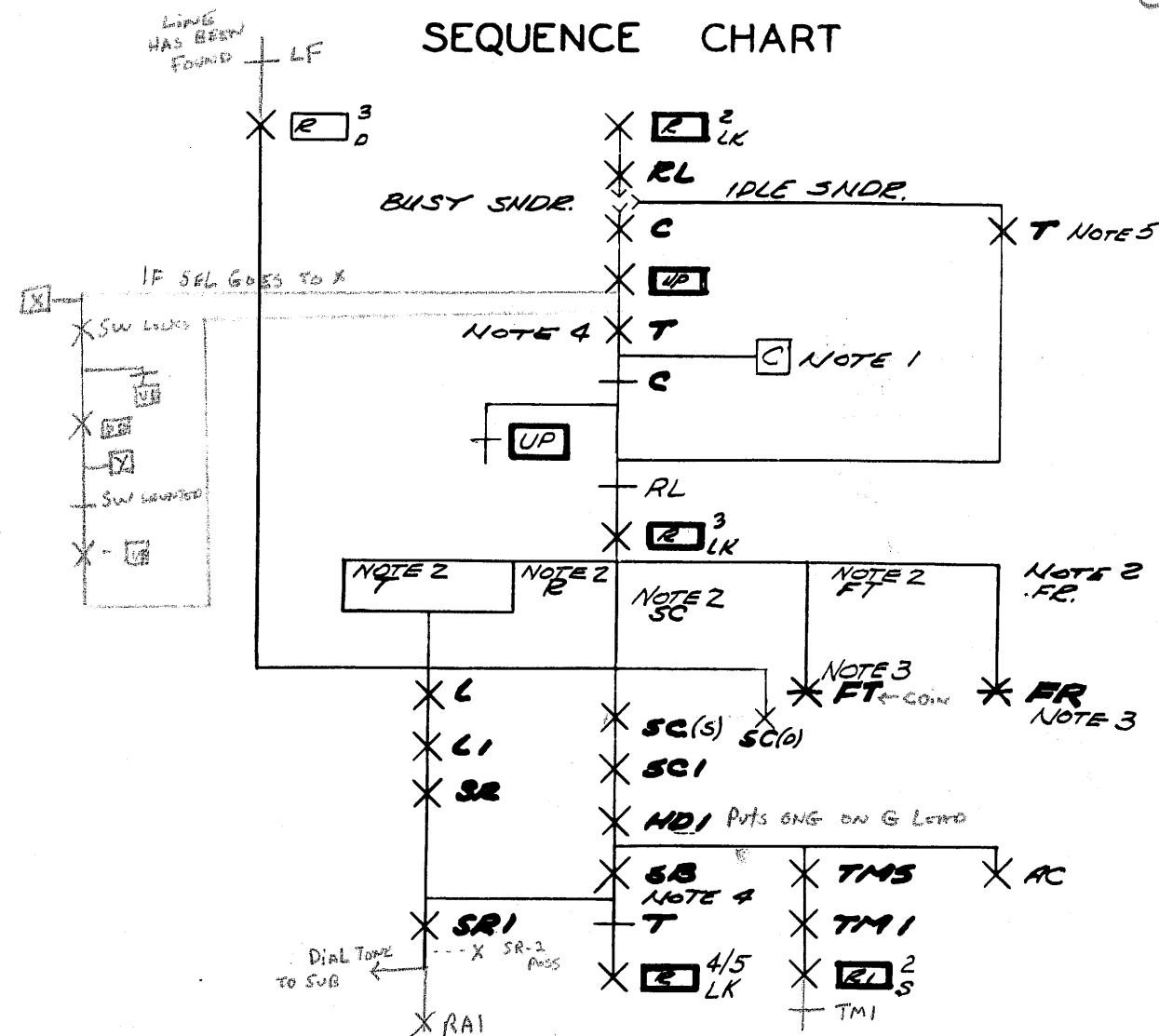
- NOTE 1 THE COMM. LOCKS THE C RELAY UNTIL THE SELECTOR ROD CENTERS ON THE TERMINAL.
- NOTE 2 WHEN THE LINK ADVANCES TO POSITION 'B' LEADS T, R, FT, FR, & SC ARE CLOSED THRU THE SENDER.
- NOTE 3 THE FT & FR RELAYS & LEADS MAY BE OPEN OR CLOSED DEPENDING UPON THE SUBSCRIBER'S CLASS OF SERVICE.
- NOTE 4 WITH THE SB RELAY NORMAL, BATTERY IS SUPPLIED TO THE T RELAY OVER THE TR LEAD. WITH THE SB RELAY OPERATED THIS LEAD IS OPENED & THE T RELAY RELEASES.
- NOTE 5 IF ALL SENDERS ARE BUSY THE SELECTOR WILL CONTINUE TO RIDE UP UNTIL THE BRUSHES REACH THE TOP OF THE COMM. WHERE THE X SEGMENT WITH GROUND ON IT WILL OPERATE THE SW RELAY TO STOP THE UP-DRIVE & ENERGIZE THE DOWN-DRIVE MAGNET. WHEN THE SELECTOR HAS REACHED THE BOTTOM THE Y SEGMENT WITH GROUND WILL SHUNT DOWN THE SW RELAY AND ENERGIZE THE UP-DRIVE MAGNET AGAIN.

Idle SENDER
HAS 2100 OHM ON TR

OFF NORMAL GRD
(HD-1) OR ANY
SEQ SW OFF NORMAL



SEQUENCE CHART



SEQ SW
R1 - Timing
R2 - Selection
R3 - P-1

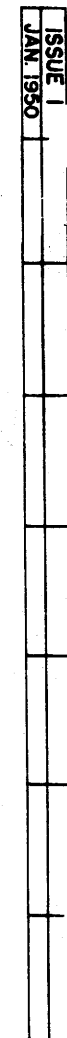
S.D. 21193-011-012-013 SUB. SDR. CCT.
S.D. 20294-011 LINK CCT.
S.D. 21077-011 LINE, FIND. & DIST. CCT.

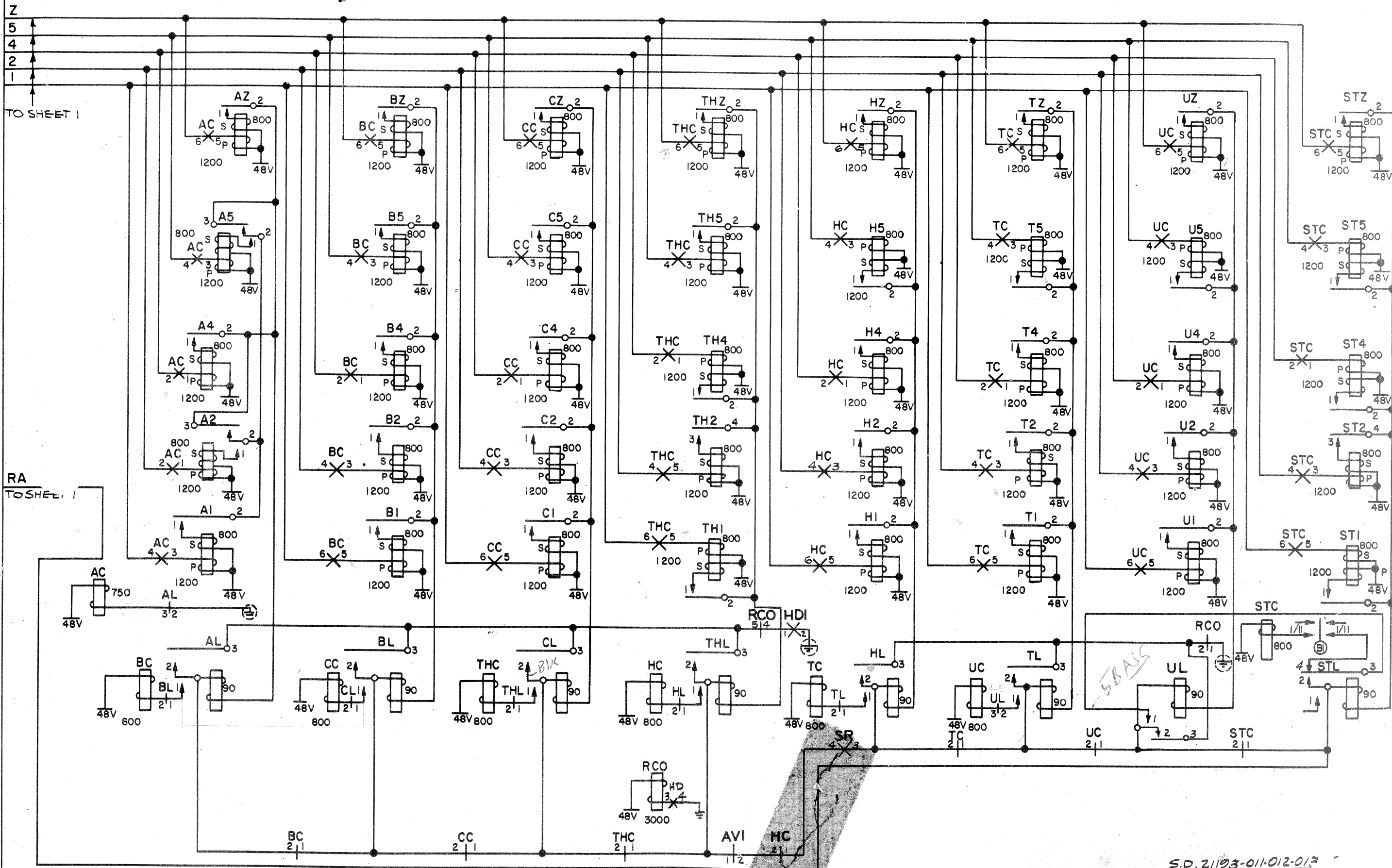
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

SEIZING A SENDER

PANEL SYSTEM
BATTERY CUT-OFF

OS-319





ISSUE 1
JAN. 1950

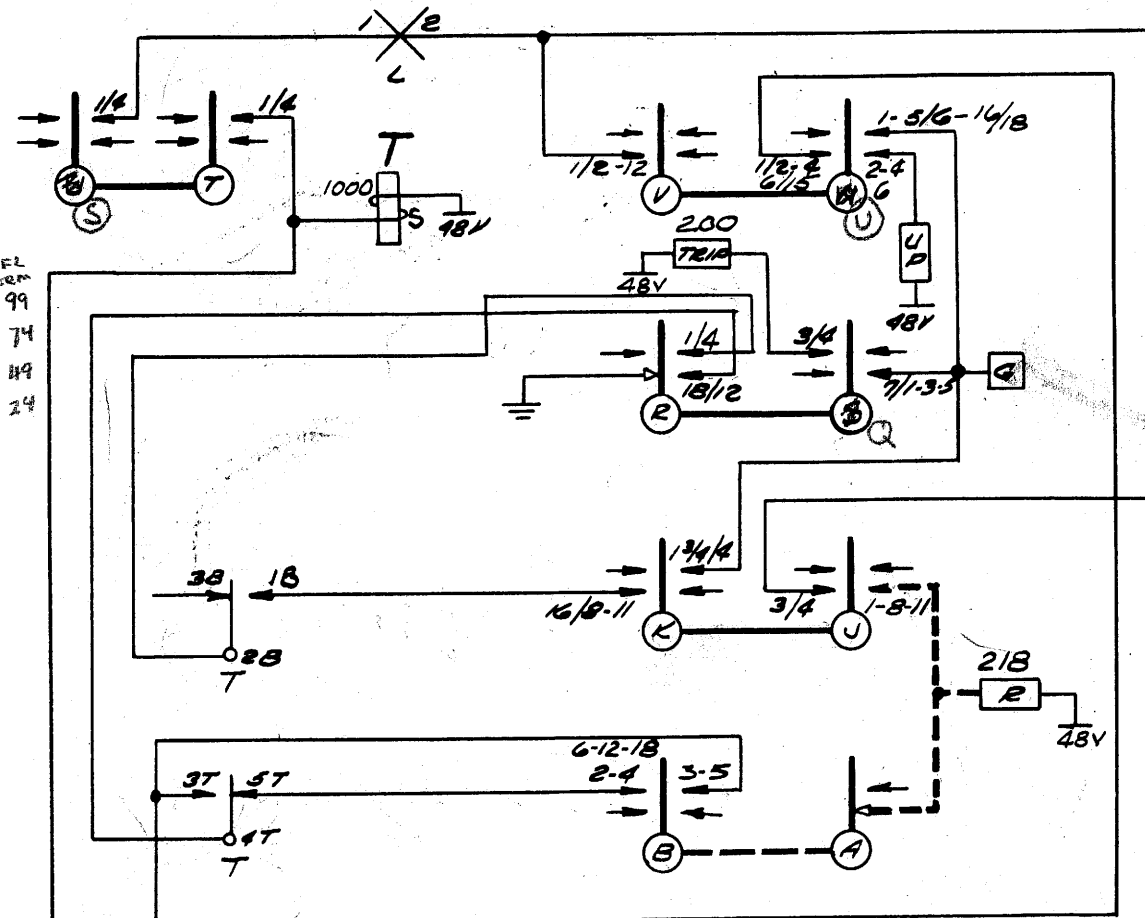
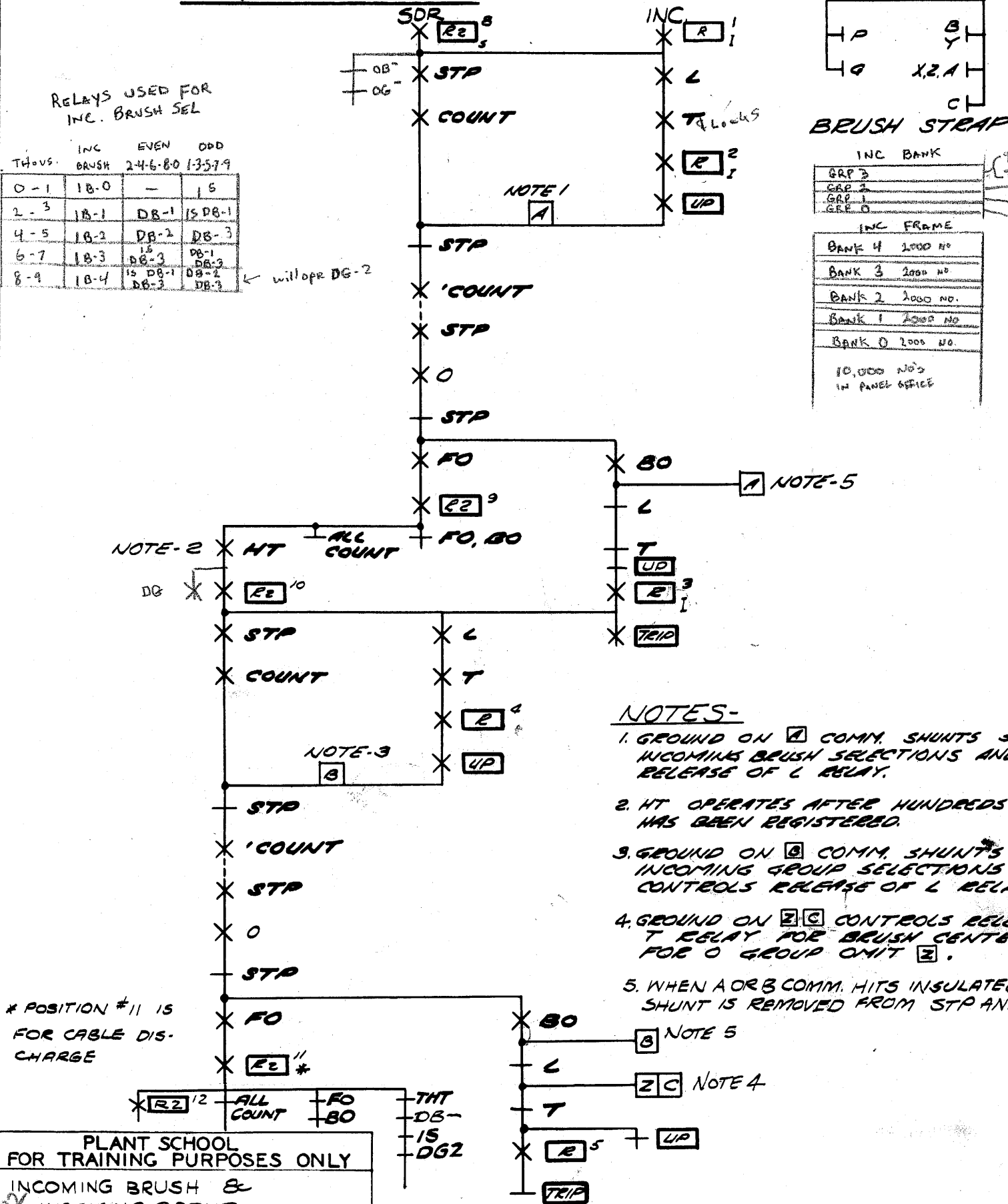
S.D. 21103-011-012-013
PLANT
FOR TRAINING
PFC

SEQUENCE CHART

RELAYS USED FOR
INC. BRUSH SEL

THOUS.	INC BRUSH	EVEN	ODD
0-1	1B-0	-	15
2-3	1B-1	DB-1	15 DB-1
4-5	1B-2	DB-2	DB-3
6-7	1B-3	DB-3	DB-1
8-9	1B-4	15 DB-1	DB-2
		DB-3	DB-3

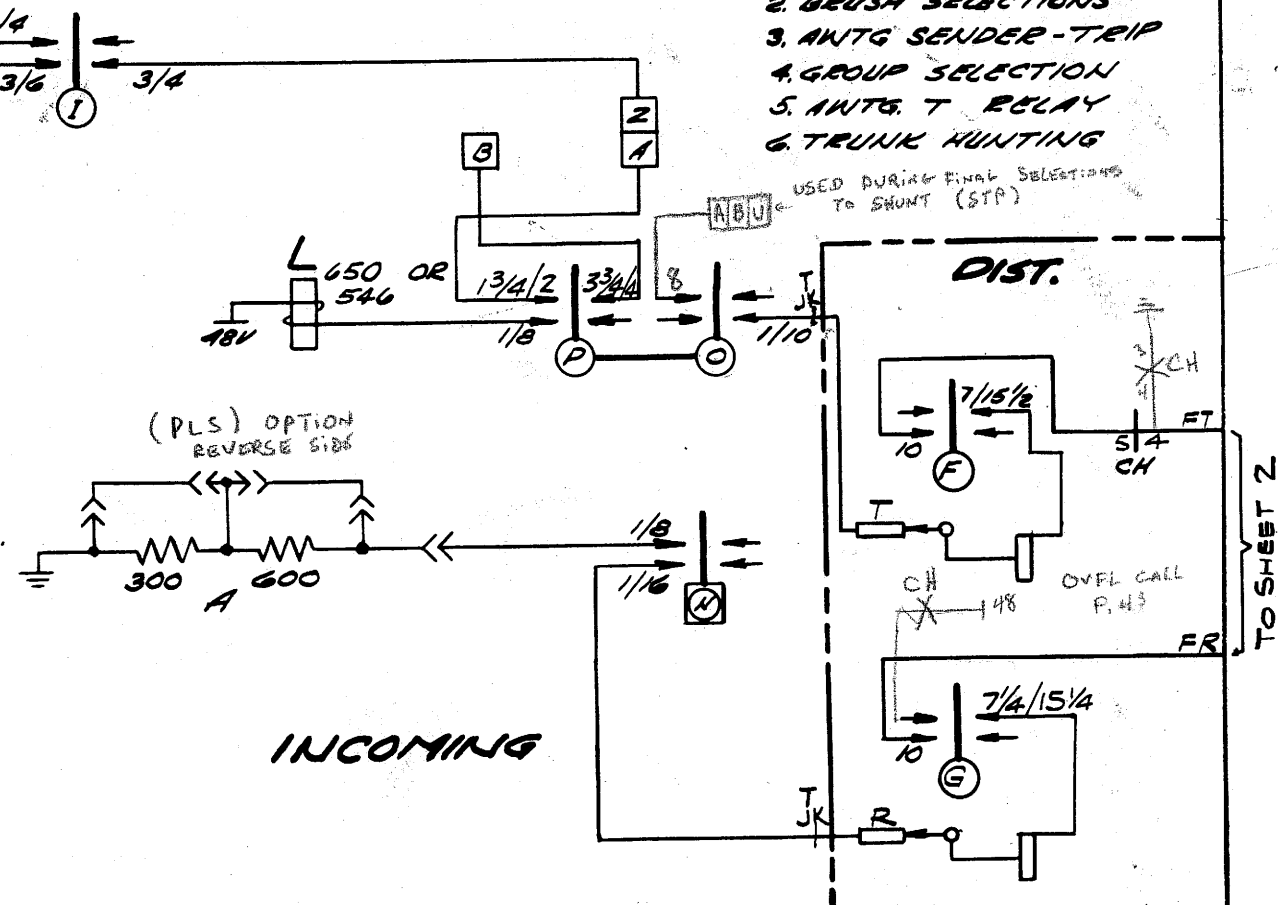
← will ope DG-2



INCOMING SWITCH POS.

1. NORMAL (YELLOW STRIPE)
2. BRUSH SELECTIONS
3. ANTG SENDER-TRIP
4. GROUP SELECTION
5. ANTG. T RELAY
6. TRUNK HUNTING

USED DURING FINAL SELECTIONS
TO SHUNT (STP)



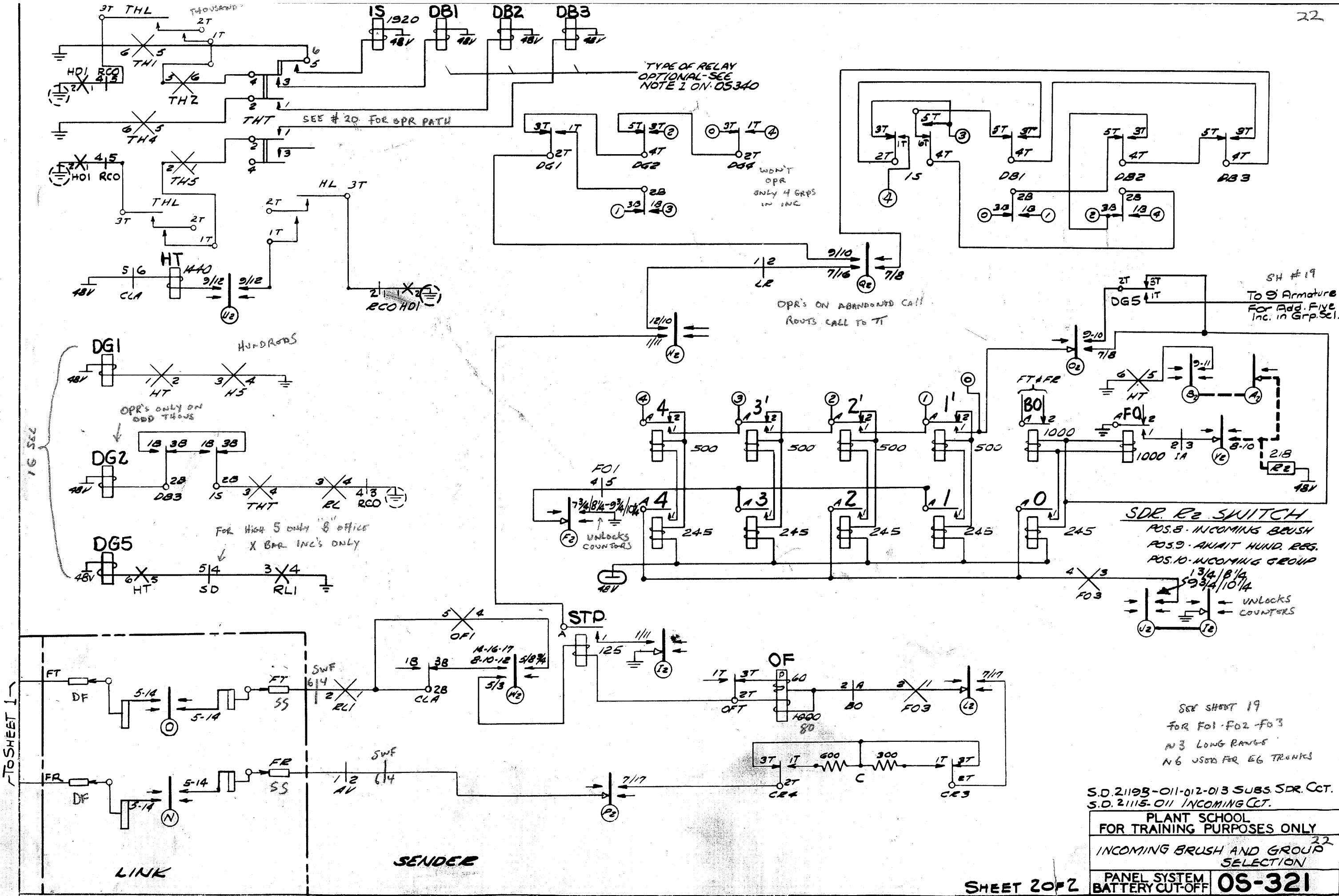
PLANT SCHOOL FOR TRAINING PURPOSES ONLY

INCOMING BRUSH &
INCOMING GROUP

PANEL SYSTEM BATTERY-CUT-OFF	OS-321
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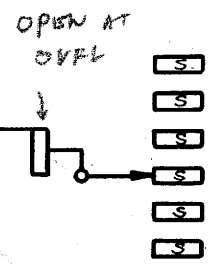
SHEET 1 OF 2

1550E/1
3-16-99



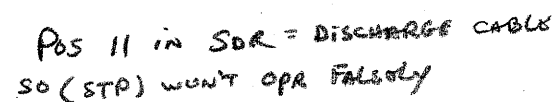
SHEET 20 of 2

S.D. 21193-011-012-013 SUBS SDR. CCT.
S.D. 21115-011 INCOMING C.T.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
INCOMING BRUSH AND GROUP SELECTION
PANEL SYSTEM
BATTERY CUT-OFF
OS-321

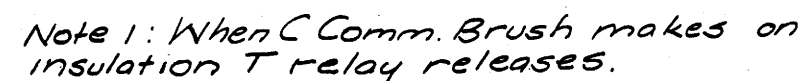


Perm SL MB CAD

After
Resigned
MILITATION
Wrote up
Reports



SDR.
SEE OS# 321

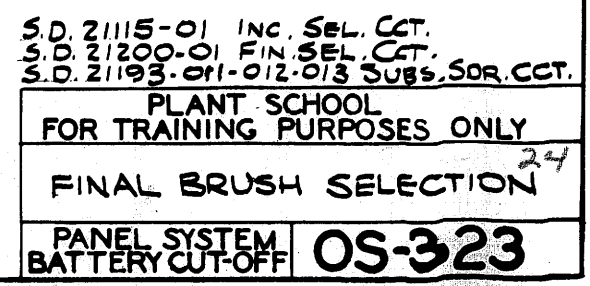


S.D. 21115-01 INC. SEL. CCT.
S.O. 21193-011-012-013 SUBS. SDR. CET.

INCOMING TRUNK HUNTING²³
CABLE DISCHARGE

PANEL SYSTEM BATTERY CUT-OFF	OS-322
---------------------------------	--------

SEQUENCE CHART



WAS DISCHARGED

48 INO DIST

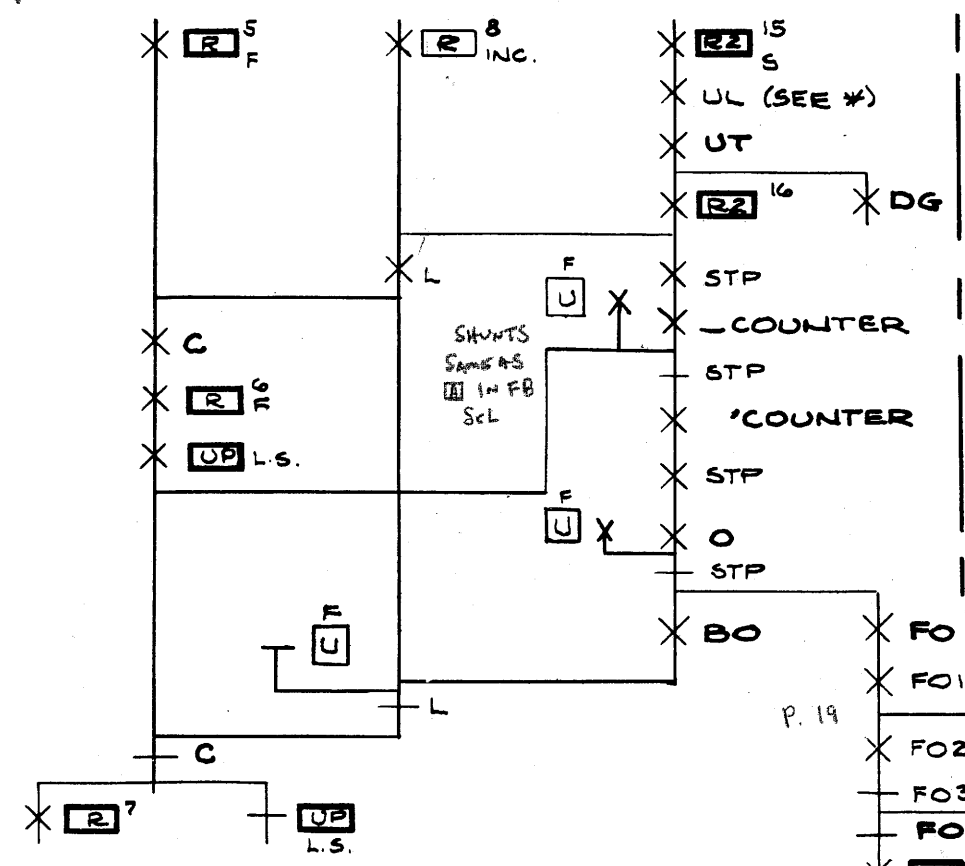


CHARGES CAPACITORS TO PREVENT
FALSE OPERATION OF (A) WHEN
APPLIED SAME POLARITY AS (A)

PUTS POTENTIAL TO CABLE
TO CHARGE CABLE CAPACITY SO WHEN
OPR IN P32 12

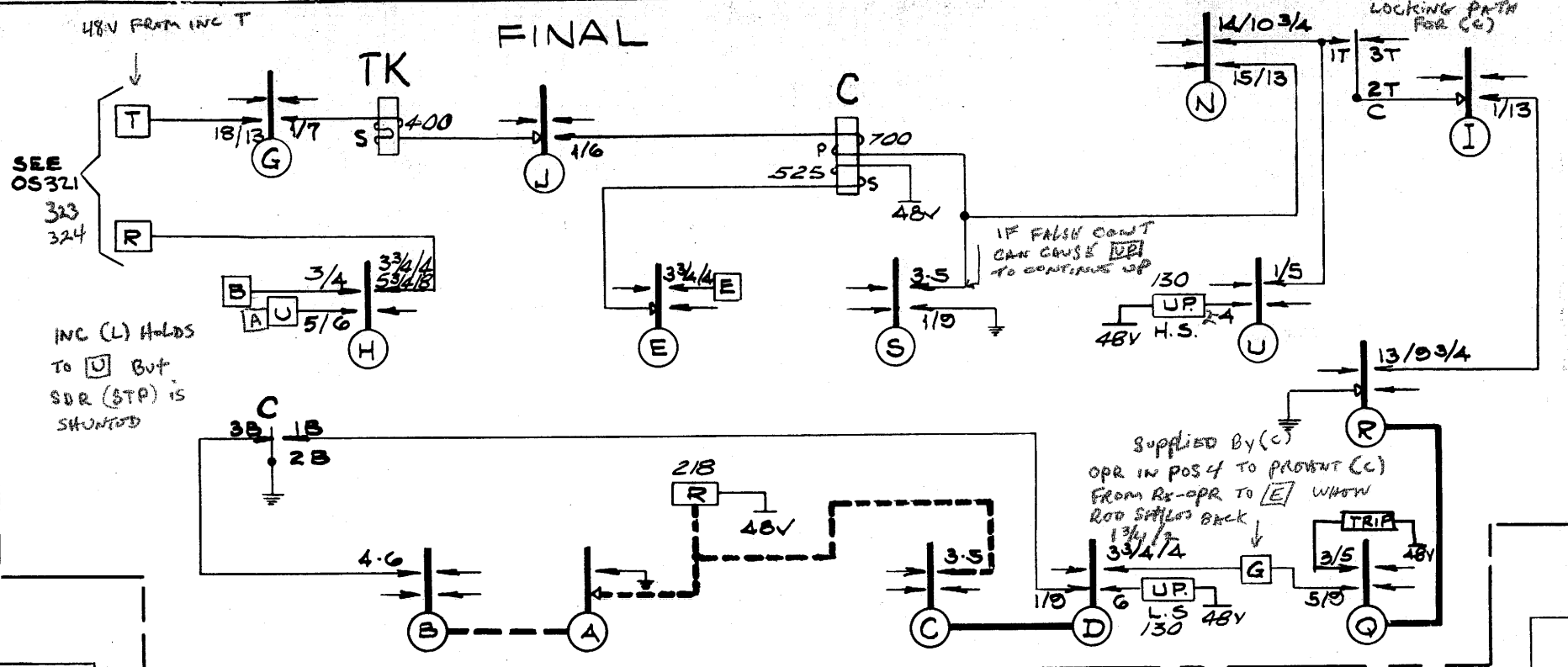
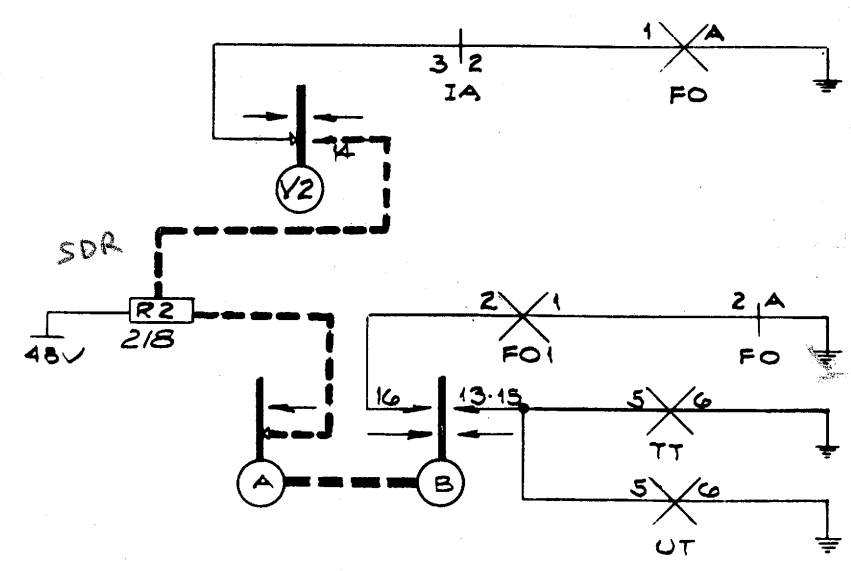
25

SEQUENCE CHART

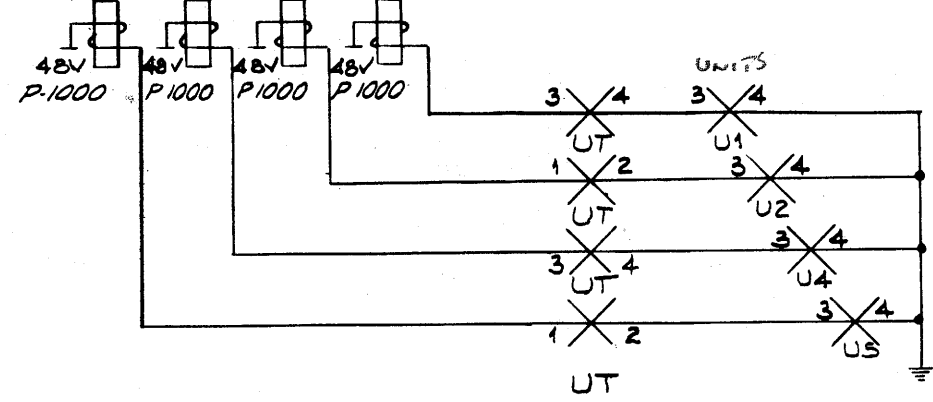


FINAL UNITS

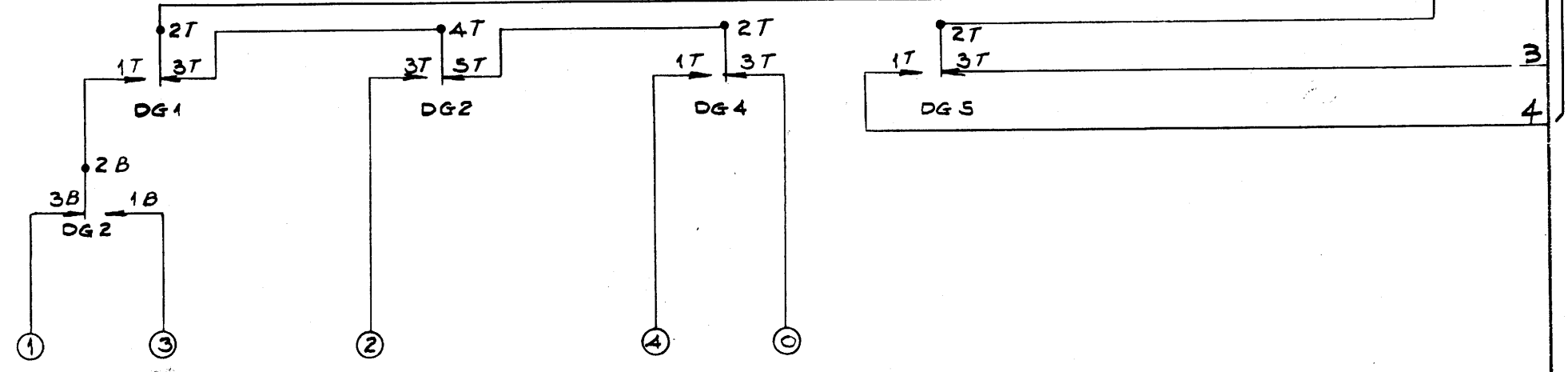
* IF UNITS HAVE BEEN DIALED



FINAL UNITS



SENDER

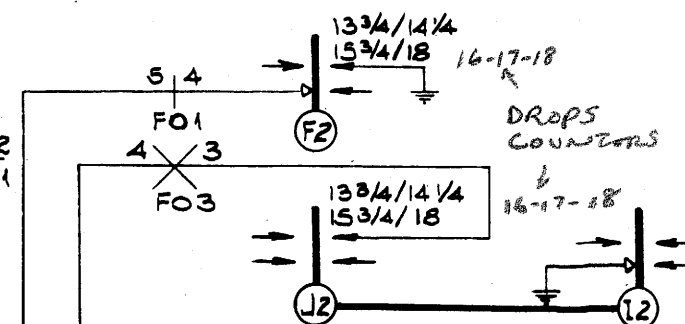
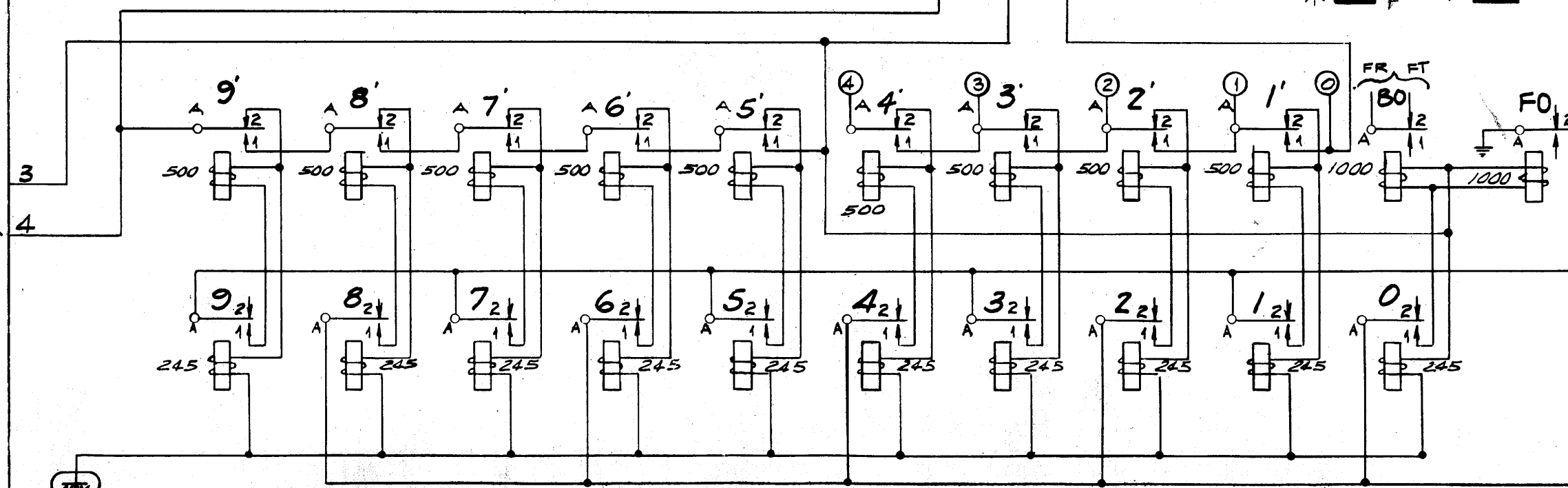
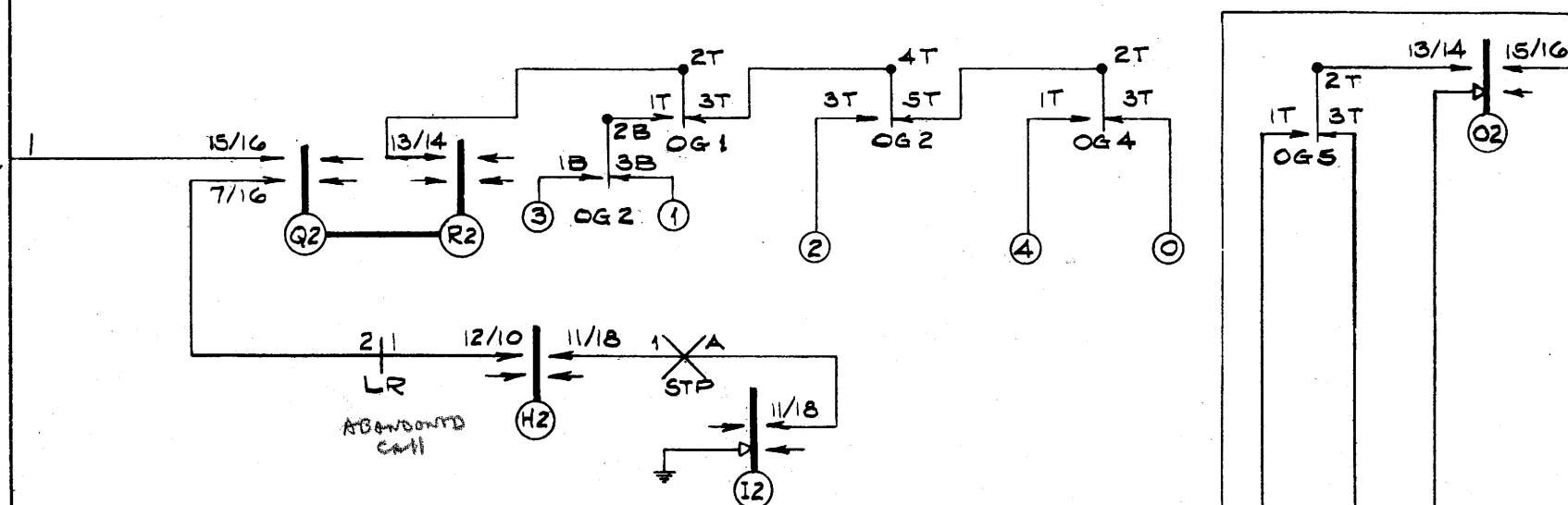
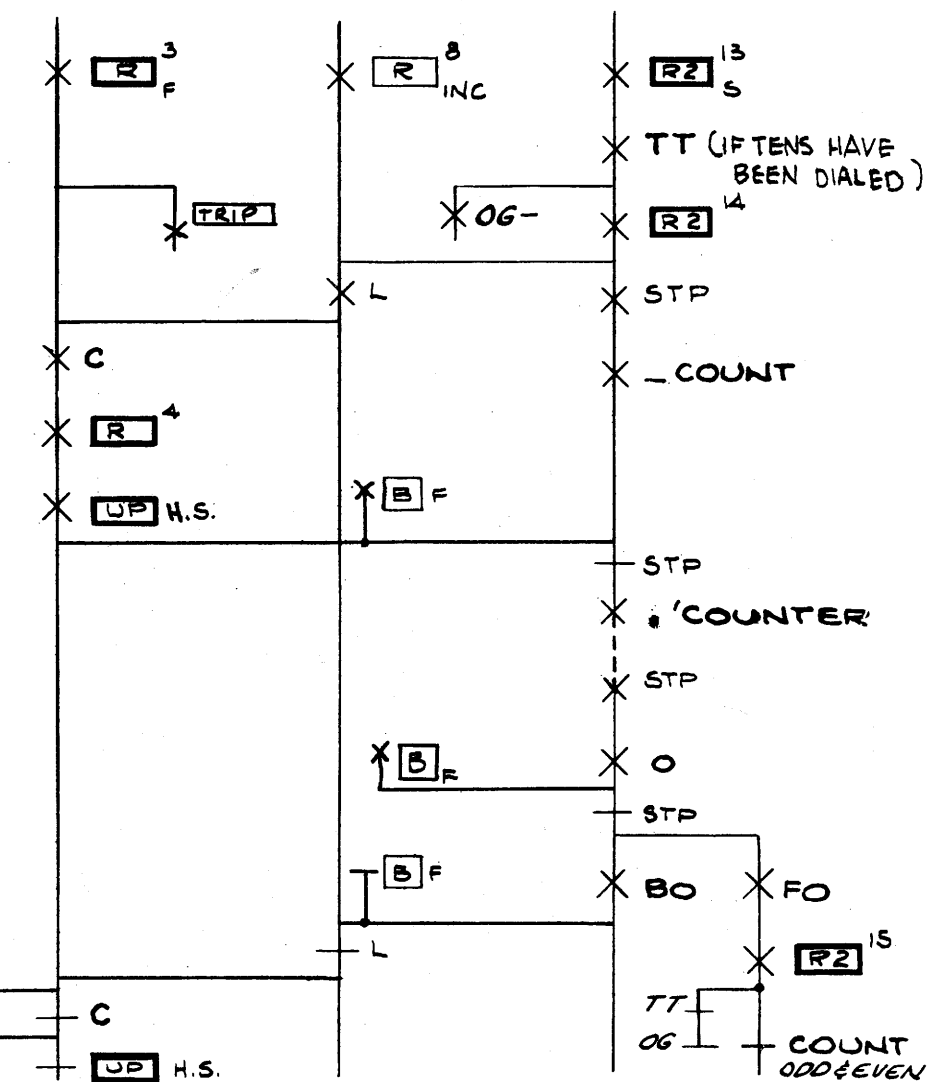
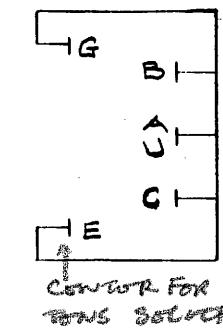
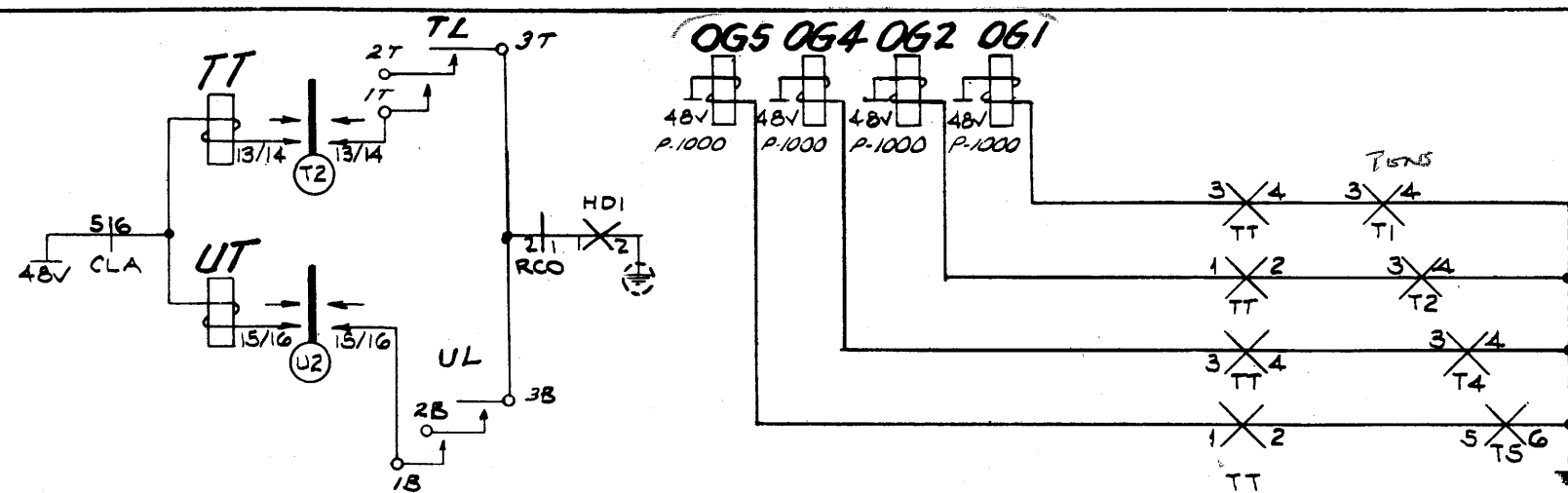


PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

FINAL TENS AND UNITS
SELECTION

PANEL SYSTEM
BATTERY-CUT-OFF **OS-324** SHEET 1 OF 2

TO SHEET 2



S.D. 21200-01 FINAL SEL. CCT.
S.D. 21193-011-012-013 SUBS SDR. CCT.

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
FINAL TENS AND UNITS
SELECTION

2	PANEL SYSTEM BATTERY CUT-OFF	OS-324
---	---------------------------------	--------

SENDER

SHEET 2 OF 2

OS-324

25

TO SHEET 1

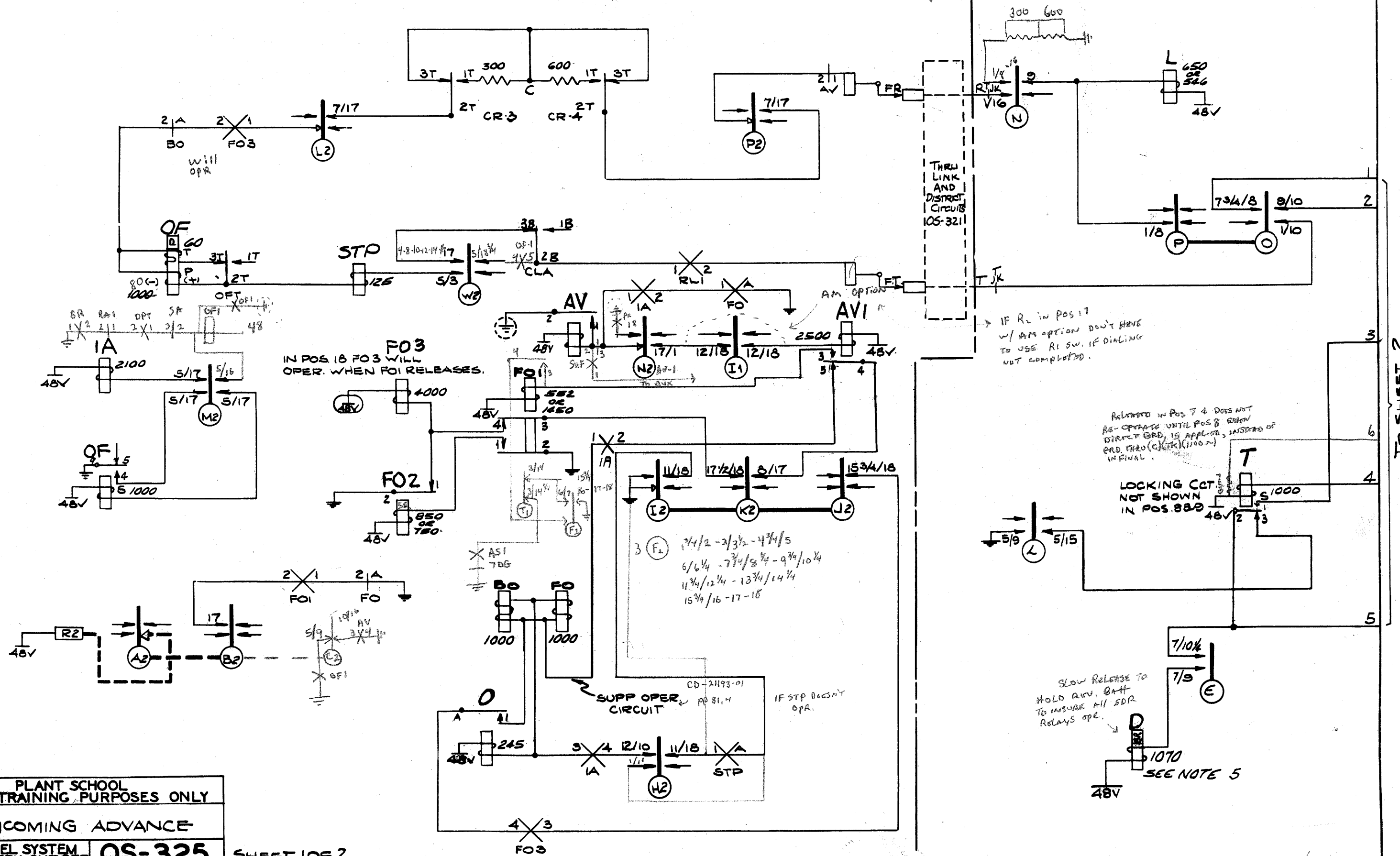
156UE 1
65-12-9
6-27-49

SENDER

IF SDR FAILS TO
RECEIVE REV BATT
POS. 17

CHECK FOR POSSIBLE F/C
RING SPR IN DIST TO
SHUNT BATT IN POS 10

INCOMING



**PLANT SCHOOL
FOR TRAINING PURPOSES ONLY**

INCOMING ADVANCE

PANEL SYSTEM	OS-325
BATTERY-CUT-OFF	

SHEET 1 OF 2

TESTIS

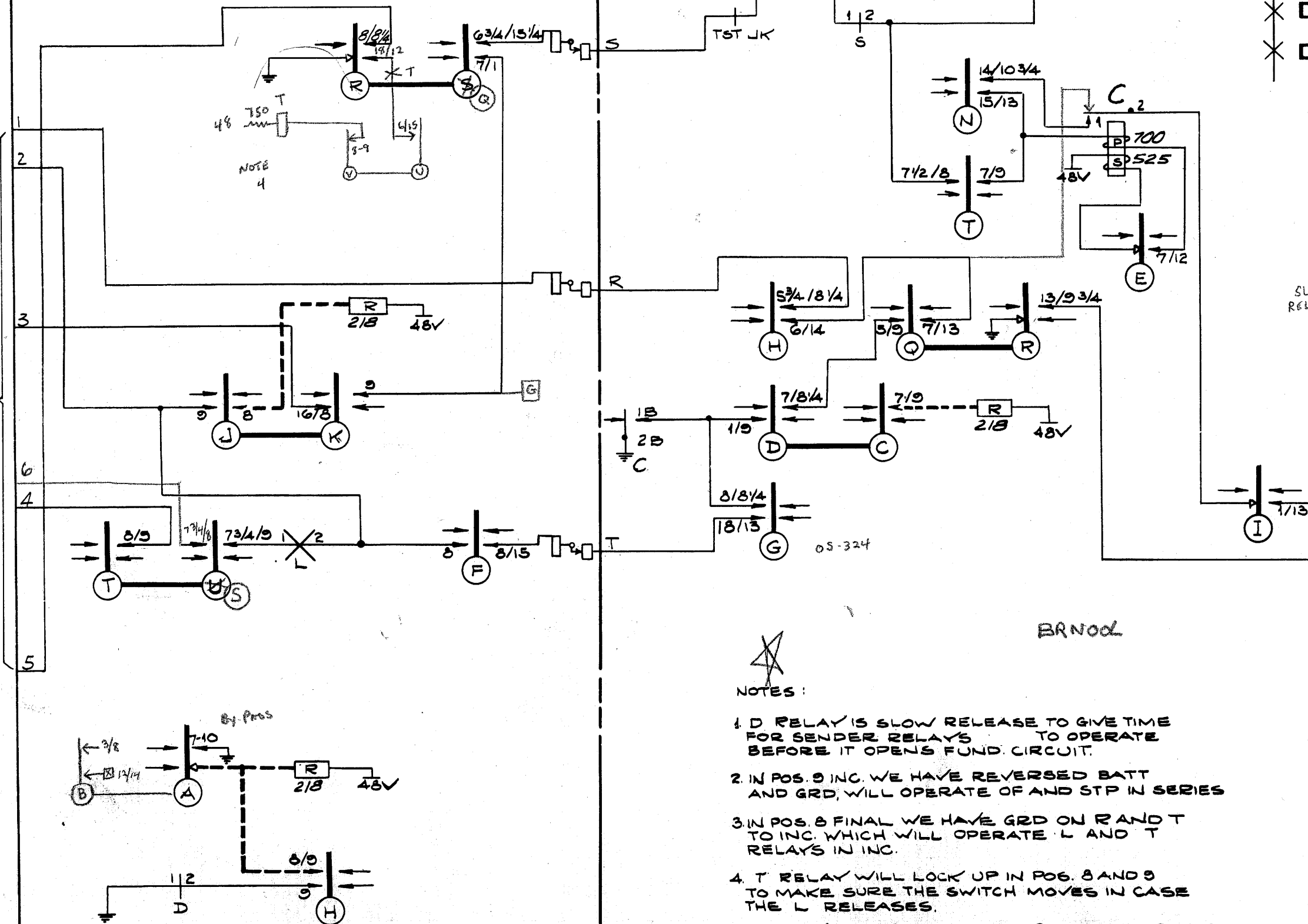
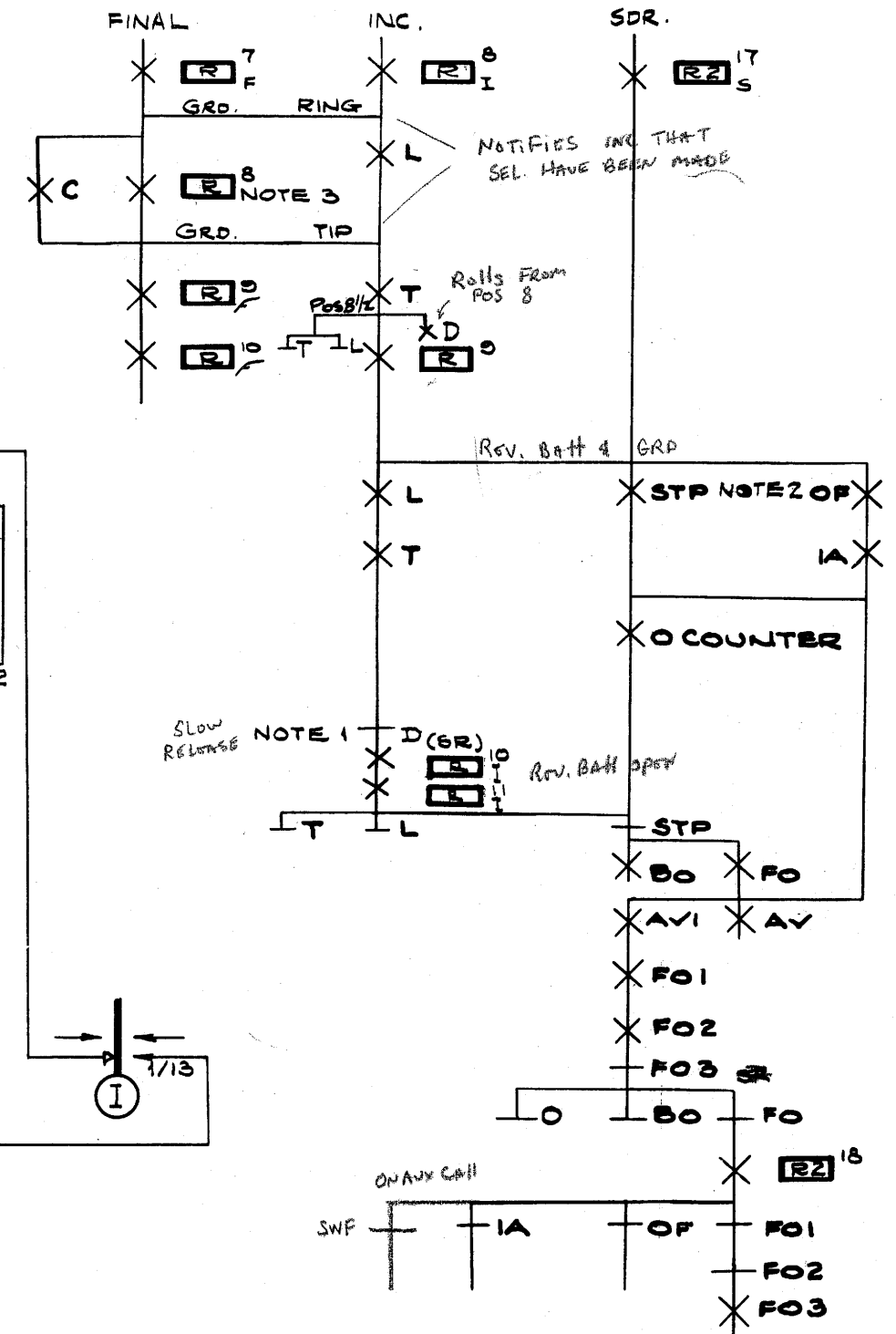
INCOMING

FINAL

(TK) will be OPR 1/10 IF
(S) IS RELEASED

SEQUENCE CHART

26



NOTES :

1. D RELAY IS SLOW RELEASE TO GIVE TIME FOR SENDER RELAYS TO OPERATE BEFORE IT OPENS FUND. CIRCUIT.
2. IN POS. 9 INC. WE HAVE REVERSED BATT AND GRD, WILL OPERATE OF AND STP IN SERIES
3. IN POS. 8 FINAL WE HAVE GRD ON R AND T TO INC. WHICH WILL OPERATE L AND T RELAYS IN INC.
4. T RELAY WILL LOCK UP IN POS. 8 AND 9 TO MAKE SURE THE SWITCH MOVES IN CASE THE L RELEASES.
5. D STAYS OPERATED IN POS. 8. TO POS. 9. OF INC.
UNTIL (T)OPS POS. 9

S.D. 21200-011 FINAL CCT.
S.D. 21115-011 INC. CCT.
S.D. 21193-011 SUBS. SDR. CCT.

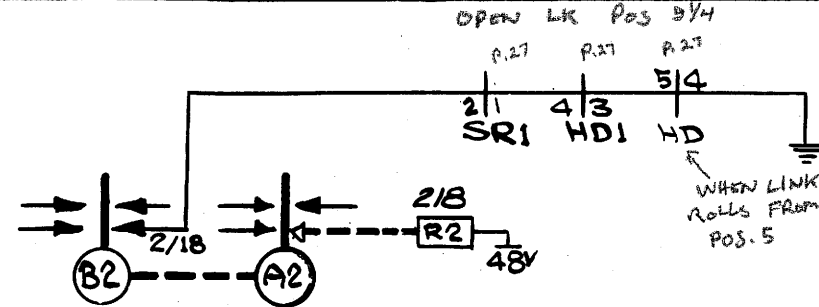
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

INCOMING ADVANCE

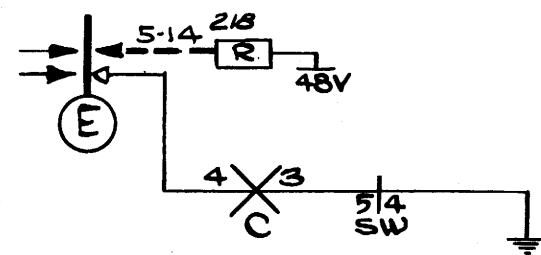
PANEL SYSTEM
BATTERY CUT-OFF **OS-325**

SHEET 2 OF 2

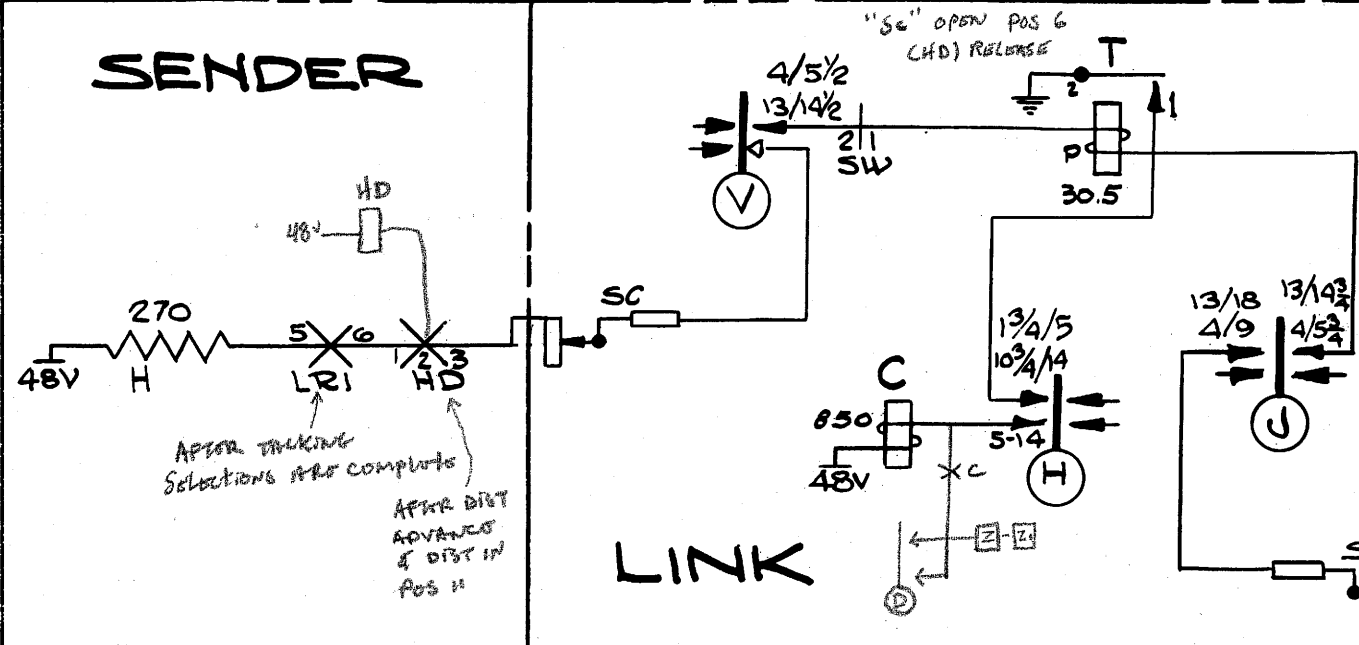
OS-325



SENDER R2 TO 1



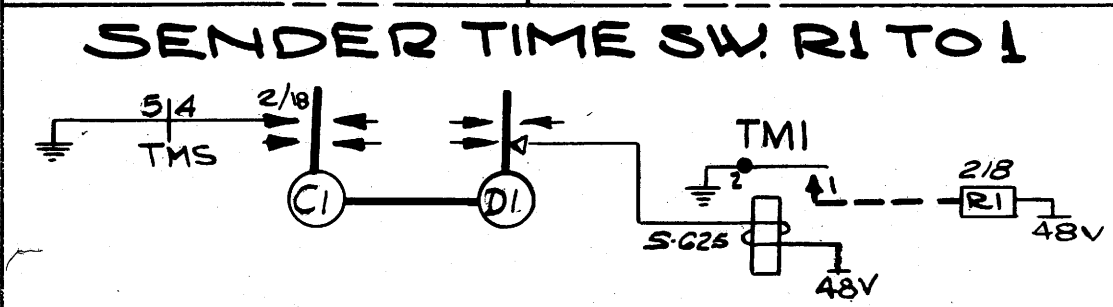
LINK R TO 6 OR 15



SENDER

DISTRICT

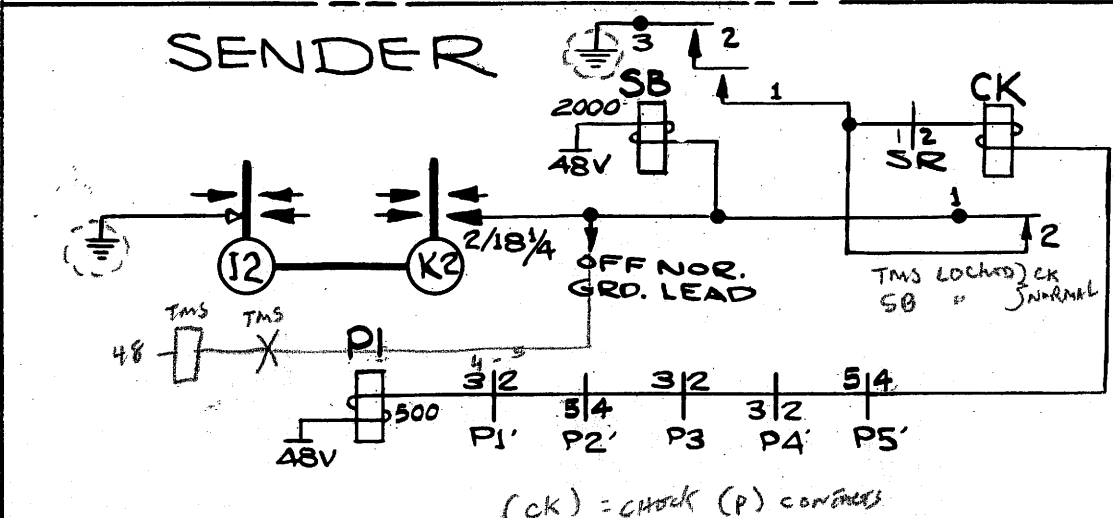
LINK



SENDER TIME SW. R1 TO 1

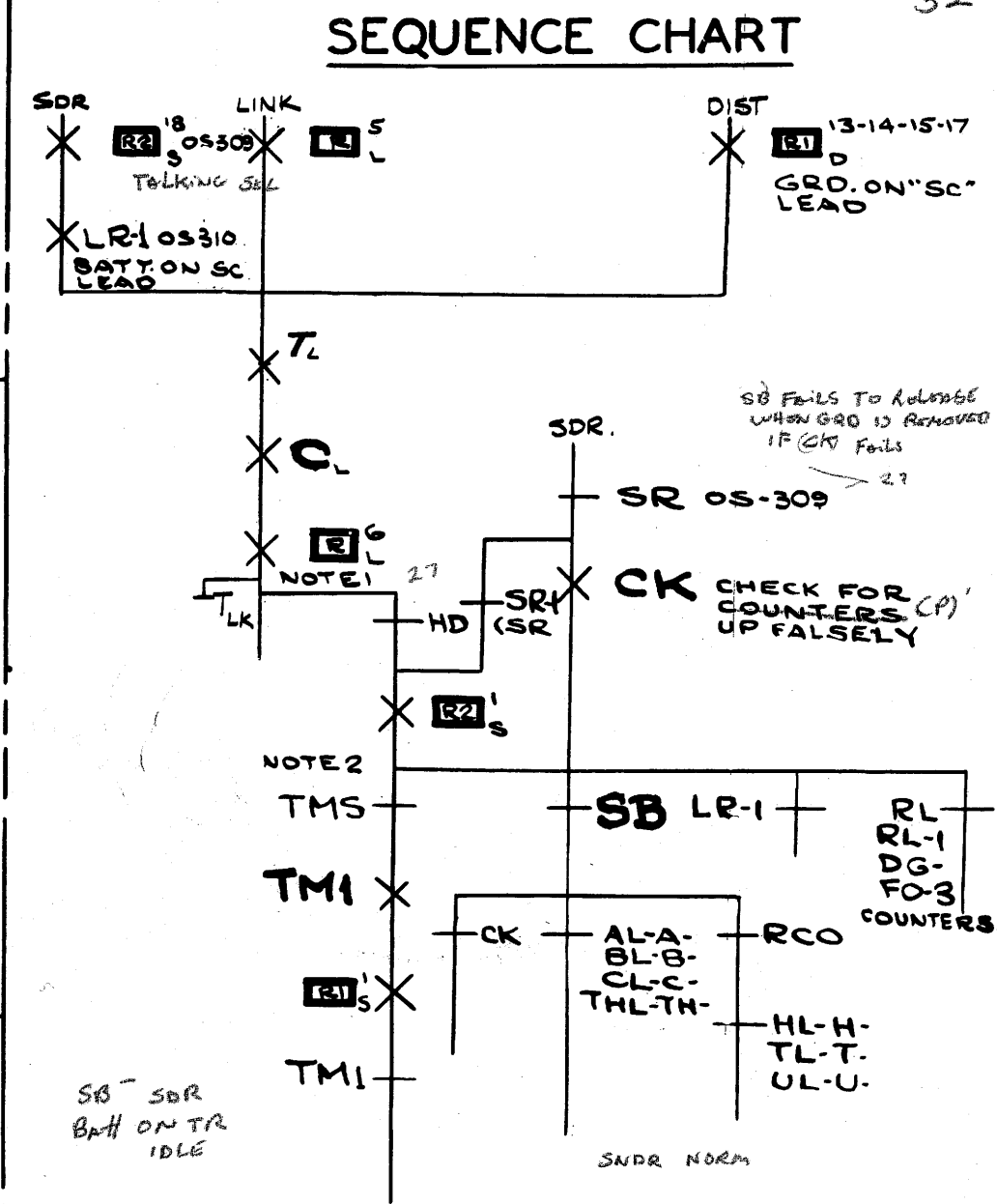
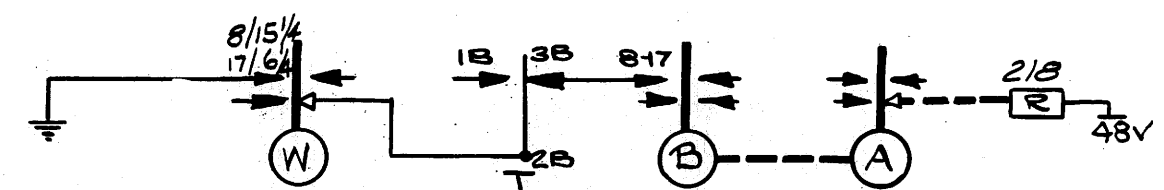
LINK SW. POS.

1-10	AWTG. CALL
2-11	HUNT SDR.
3-12	AWTG. SDR
4-13	PASS BY
5-14	CUT THRU
6-15	RETURN FROM LAST 20 SDR TERM OR PASS BY.
7-16	HUNT DIST OR OUT OF SER.
8-17	AWTG. DIST.
9-18	AWTG. ALLOTMENT



SENDER

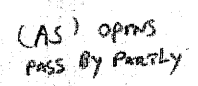
LINK R TO POS 9



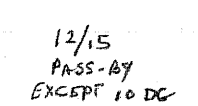
SEQUENCE CHART

- NOTES:
1. ALL LEADS OPEN TO SDR WHEN LINK LEAVES POS. 5.
 2. LAST SOURCE OF OFF NOR. GRD. REMOVED.

- | | |
|-------|----------|
| 155U4 | 10-10-49 |
|-------|----------|



50

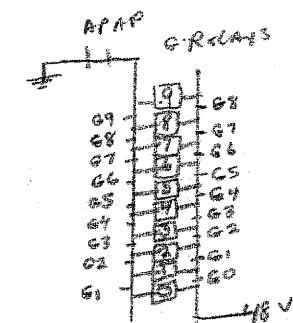
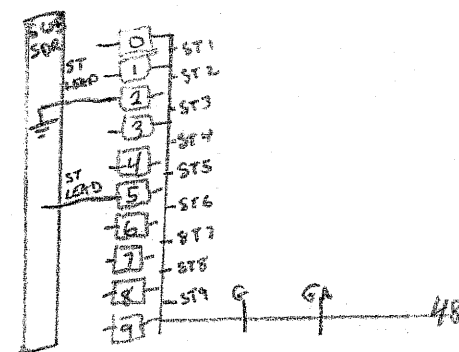


CD - 21193,01 P. 113-131

AUX SDR LINE

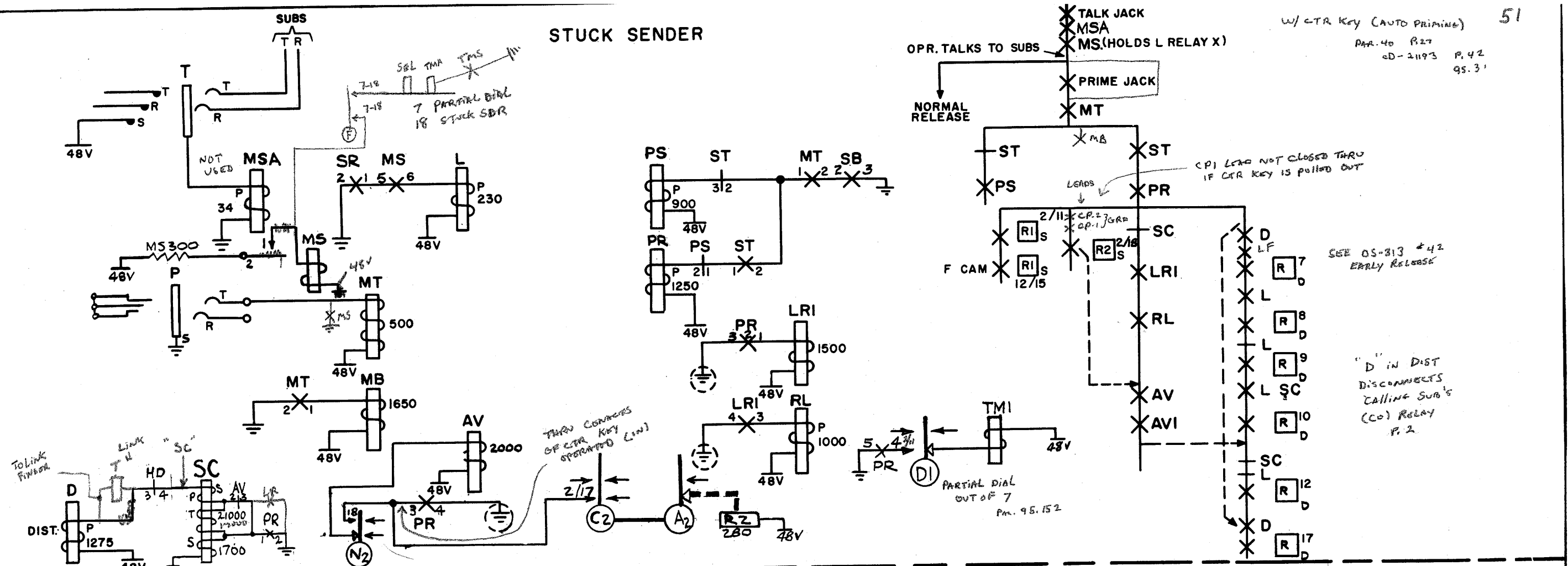
SAME AS HOLD MAG

ST - Relays

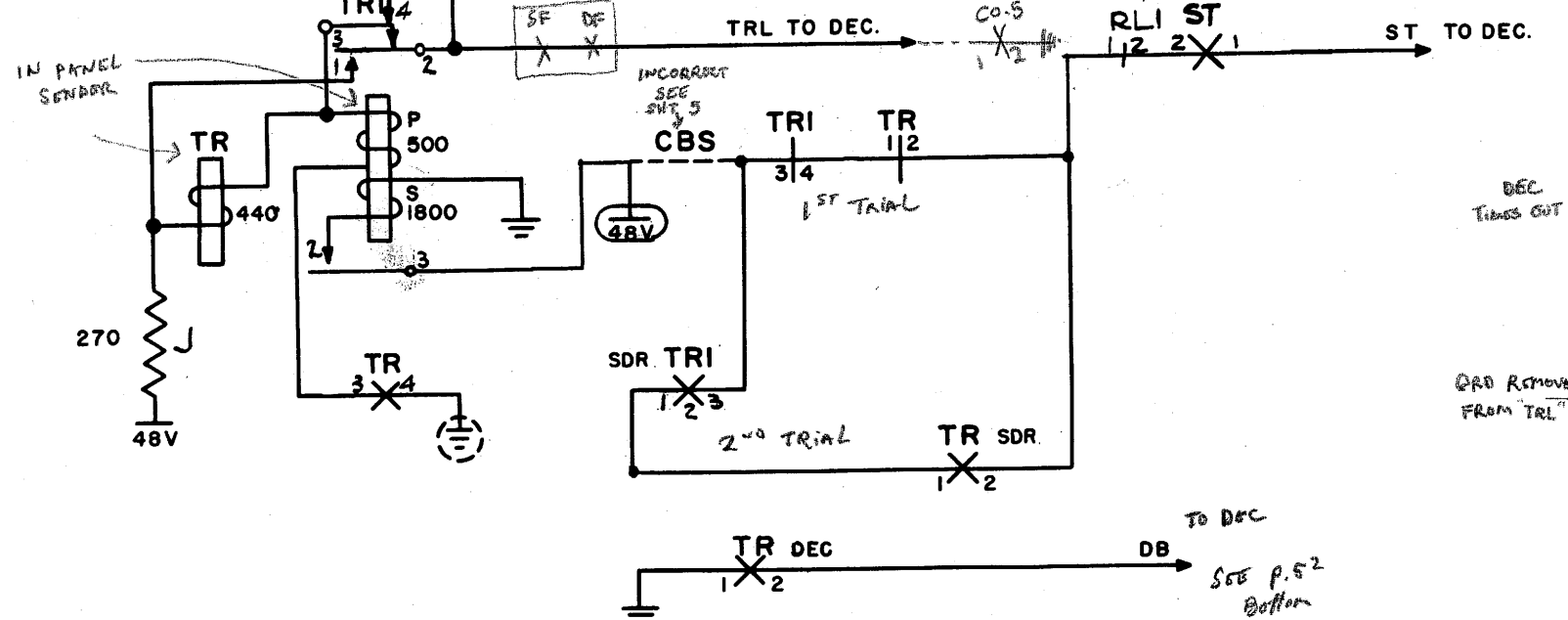


ISSUE 1
JAN 1950

STUCK SENDER



SECOND TRIAL



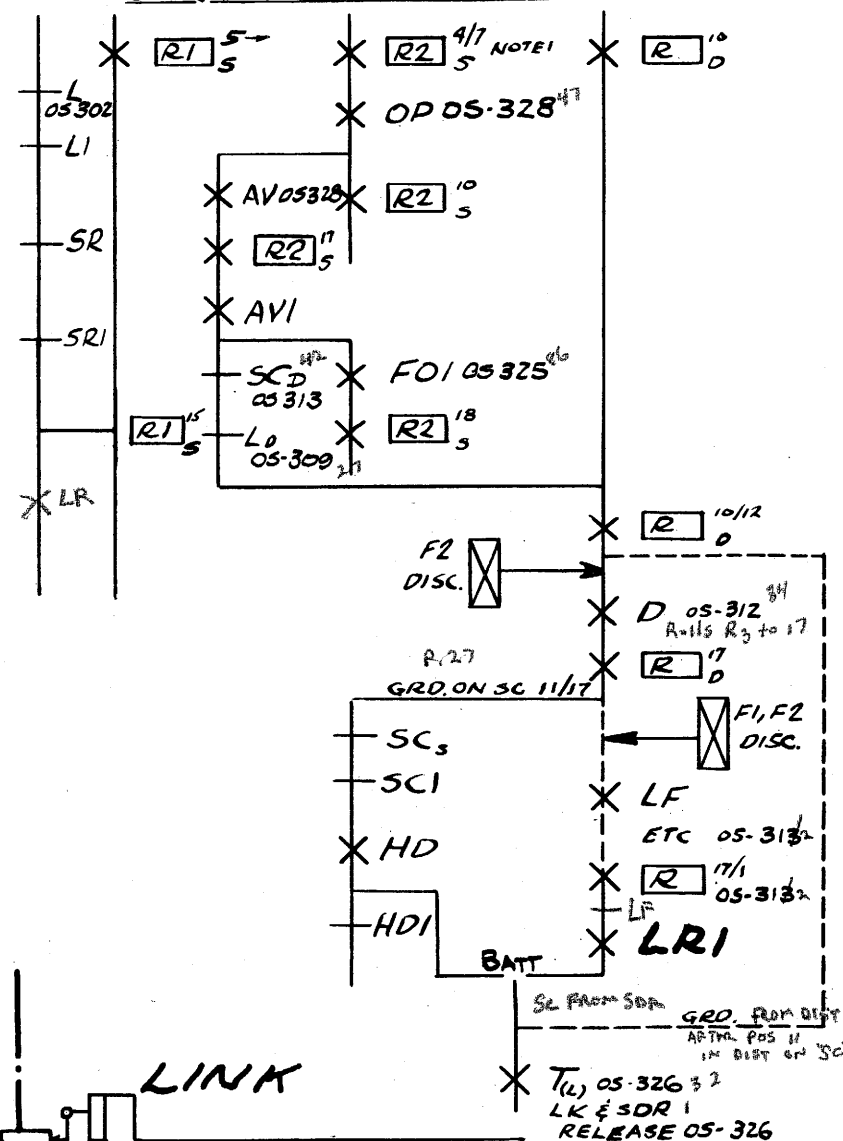
- ST NORMAL
- SF
- SG
- DS
- DF
- DG
- DEC Times Out
- GND "TRL" FROM DEC
- TR (SDR)
- ST (SDR) LEAD OPENED P. 5
- ALL CANN RELAYS
- TR-1 (SDR) - SHUNTING GND REMOVED
- ST (SDR)
- SF-SG-DS-DF-DG P. 5

S.O. 21193-011-012-013 SUBS. SDR. CCT.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
STUCK SENDER 51
SECOND TRIAL
PANEL SYSTEM BATTERY CUT-OFF OS-329

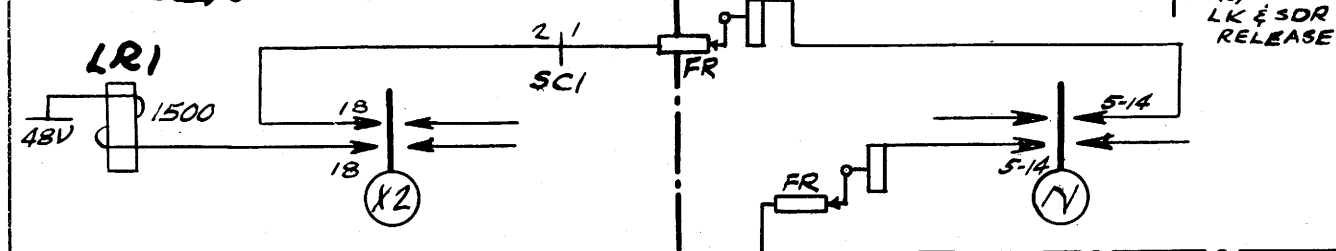
6
4

SD-21193
P. 89
P. 41

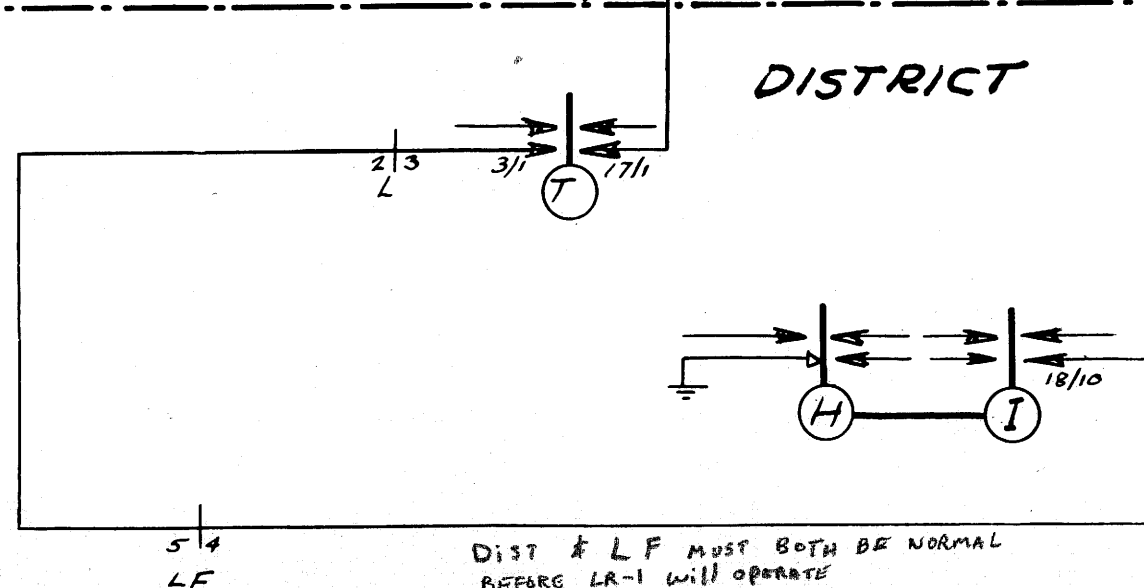
SEQUENCE CHART



SENDER

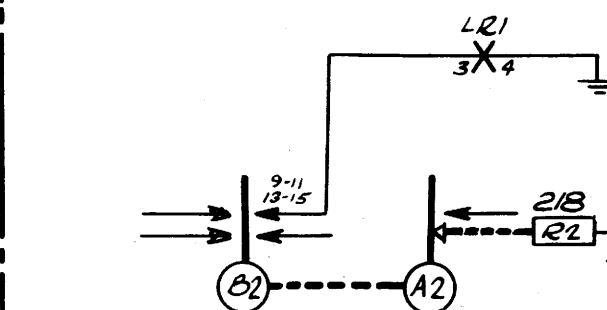


DISTRICT

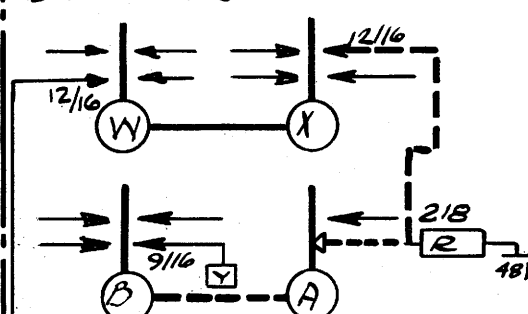


DIST & LF MUST BOTH BE NORMAL
BEFORE LR-1 WILL OPERATE

**FULL MECHANICAL
SENDER**



DISTRICT



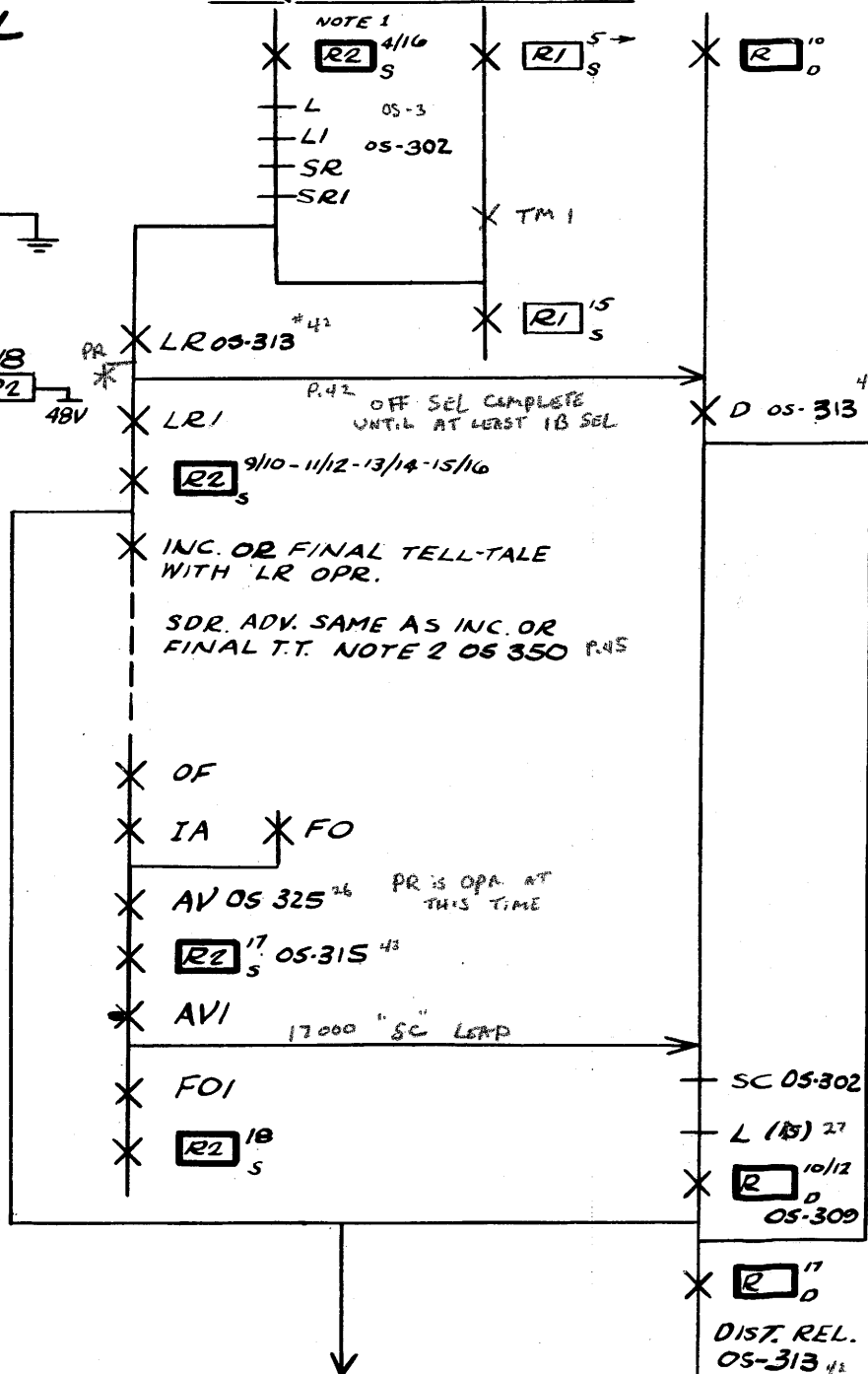
NOTES:

1. SDR. COMPLETES WHATEVER IS LEFT OF OFFICE TEST, OFF. GP. AND TRK. TEST.
2. INC. OR FINAL TO TELL-TALE BECAUSE LR OPENS COUNTING RLY. CIRCUIT.

ABANDONED CALL

SEQUENCE CHART

49



LK. ADV &
REL SDR.
OS-314 31
OS-309-27

S.D. 21077-011 LINE, FIND. 8D 1ST. CCT.
S.D. 21193-011-012-013 SUBS. SDR, CCT.

PLANT SCHOOL FOR TRAINING PURPOSES ONLY

LATE RELEASE
FULL MECH. & OPR. CALLS

PANEL SYSTEM BATTERY CUT-OFF	OS-330
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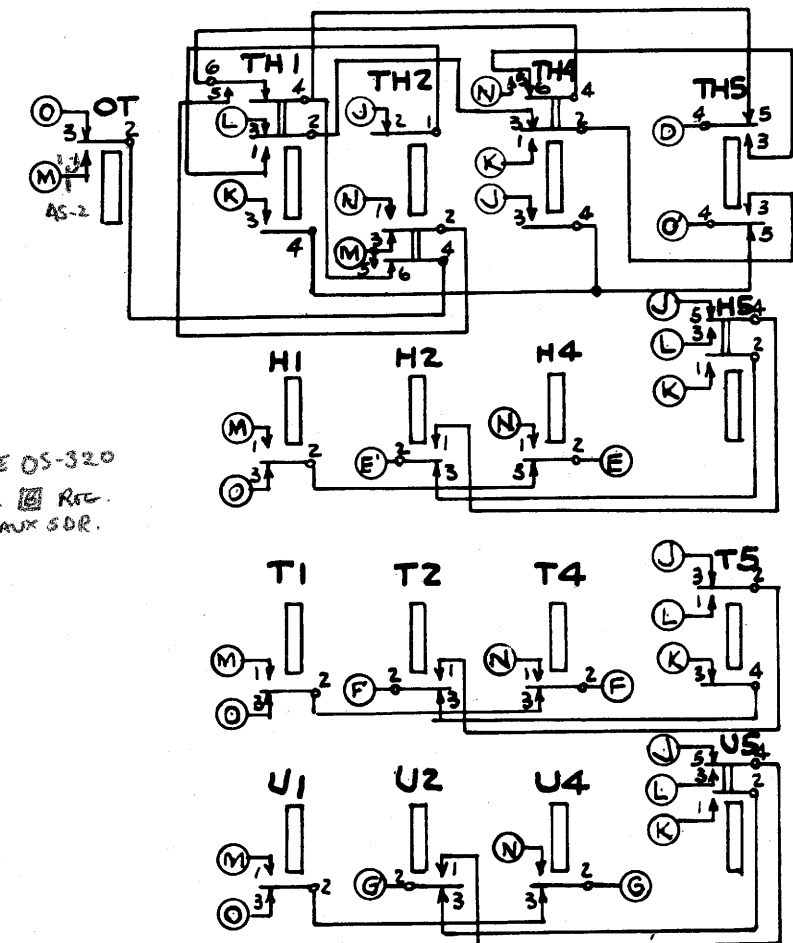
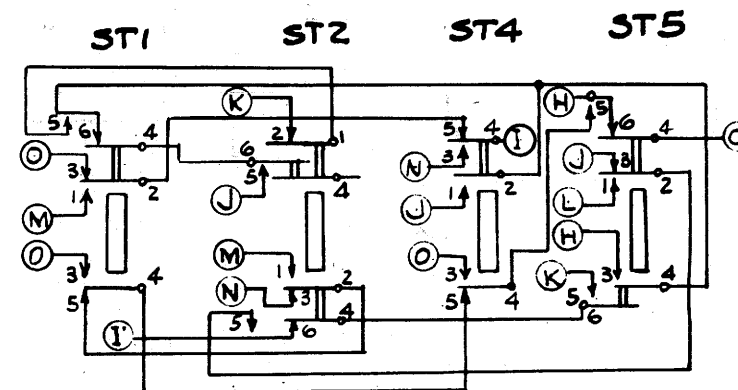
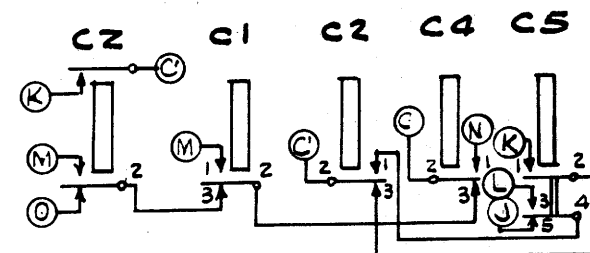
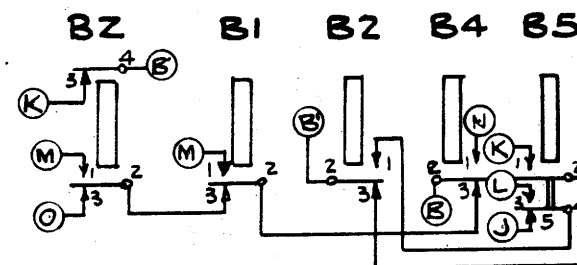
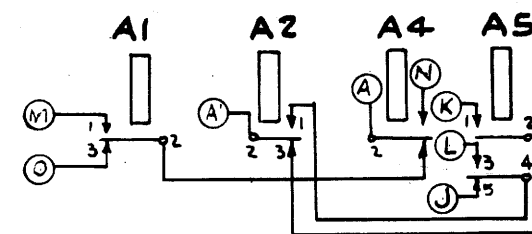
REG. RELAY CIRCUIT

NOTES

- #2 & #3 Springs make 1/4 before & after Pos. indicated.
- #3 Spring makes 1/2 before & after Pos. indicated.
- #2 Spring makes 1/2 after Pos. indicated.
- FP & FPI releases when R3 leaves Pos. 10 on 2nd rev.
- SP operates from C1 relay.
- LR & LRI operates abandoned calls.
- + & - sent over tip, - & = sent over ring.
- ⓐ Furnishes - 2nd period ⓑ Furnishes - 2nd & 4th period.
ⓐ Furnishes - 4th period ⓑ Furnishes + 1st period ⓓ Furnishes + 3rd period.
- + Pulses are never sent in both 1st & 3rd periods.
- Pulses are sent in both 2nd & 4th period regardless of reg. relays.
= is superimposed in 2nd & 4th period by Reg. relays.

PULSE CHART

Pulse Code Chart for 3 digit senders						
Sta.	Thou	Other	Pulses			
			1st	2nd	3rd	4th
0	0	0	-	-	-	-
1	2	1	+	-	-	-
W	4	2	-	-	-	-
R	6	3	+	-	-	-
J	8	4	-	-	+	-
M	1	5	-	-	-	-
	3	6	+	-	-	-
	5	7	-	-	-	-
	7	8	+	-	-	-
	9	9	-	+	-	-
1st CYCLE STA	16 3/4 / 14	17 1/2 / 18 1/2	18 3/4 / 19 1/4	19 1/2 / 20 1/2		
2nd " TH	20 3/4 / 21 1/4	21 1/2 / 22 1/2	22 3/4 / 23 1/4	23 1/2 / 24 1/2		
3rd " H	24 3/4 / 25 1/4	25 1/2 / 26 1/2	26 3/4 / 27 1/4	27 1/2 / 28 1/2		
4th " T	28 3/4 / 29 1/4	29 1/2 / 30 1/2	30 3/4 / 31 1/4	31 1/2 / 32 1/2		
5th " U	32 3/4 / 33 1/4	33 1/2 / 34 1/2	34 3/4 / 35 1/4	35 1/2 / 36 1/2		
Final Heavy pulse	17 3/4 / 18 1/4 (2nd Rev.)					



SEE OS-320
FOR REG.
W/ AUX SDR.

R3

P67

565 48 B

S.D. 21193-011-012-013 SENDER

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

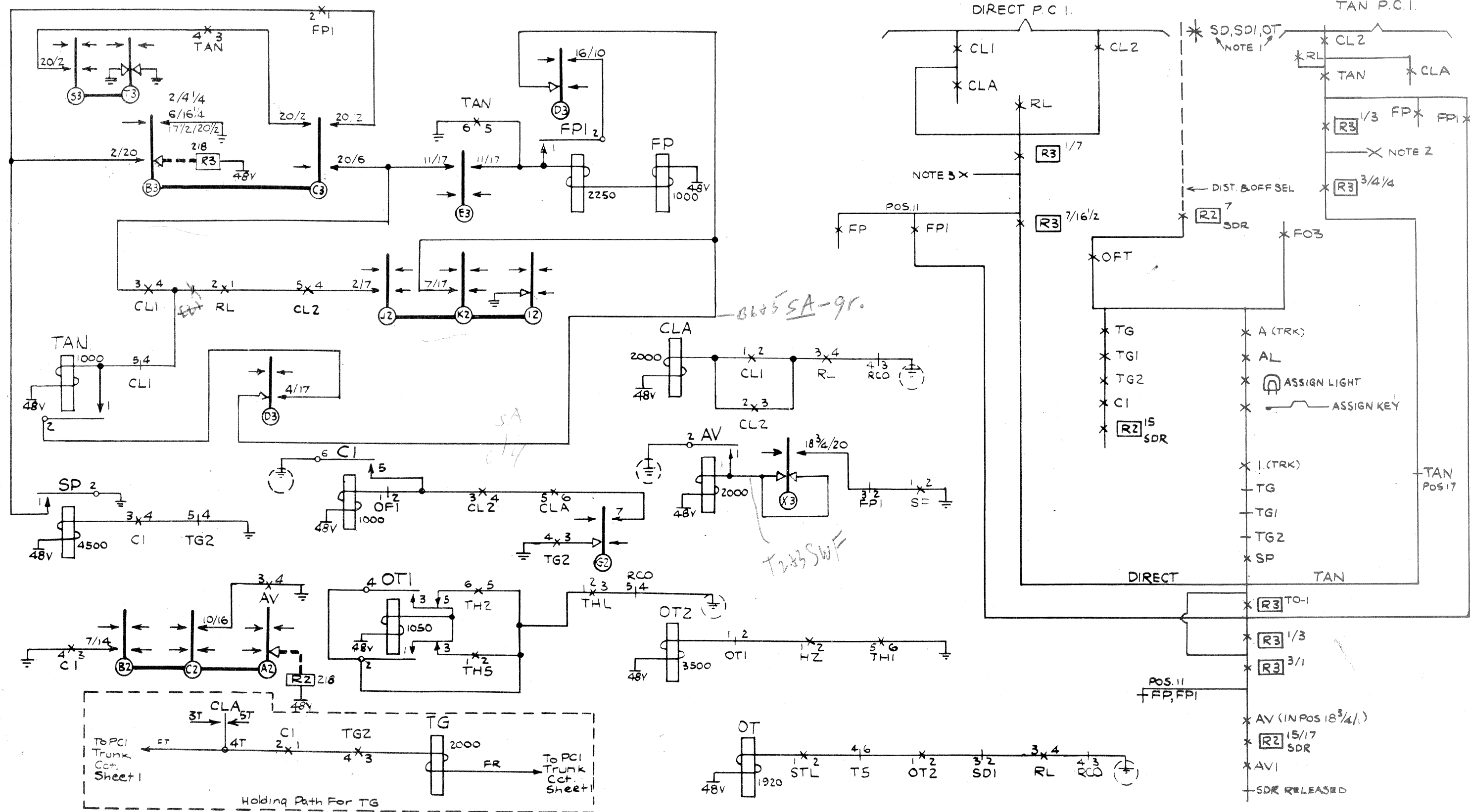
PCI IMPULSE

48

PANEL SYSTEM
BATTERY CUT-OFF

OS-331

SHEET 2 OF 4



PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

P.C.I. IMPULSES

PANEL SYSTEM
BATTERY CUT-OFF

OS-331

SHEET 3 OF 4

NOTES

OT - POSSIBLE {STA DELAY}	A	ABOVE AND PARTYS - NONE
	B	ABOVE AND NO PARTYS - SD
OT - IMPOSSIBLE {STA DELAY}	C	BELOW AND NO PARTYS - SD, SDI
	D	BELOW AND PARTYS - SDI

2. B3CAM ADVANCES SW FROM 3 TO 4 1/4 ON TAN

3. B3CAM ADVANCES SW FROM 6 TO 16 1/4 ON DIRECT

SEE NOTE 3

STATIONS
W

S3 T3

FT

FR

THOUSANDS
2

S3 T3

FT

FR

HUNDREDS
3

S3 T3

FT

FR

TENS
7

S3 T3

FT

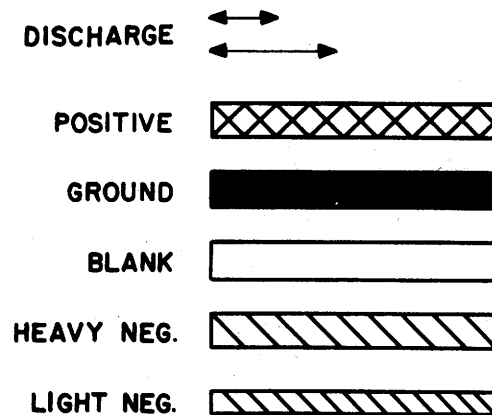
FR

CSTA
UNITS
5

S3 T3

FT

FR



- NOTE 1. HEAVY POSITIVE ON "FT" TO ADVANCE P.C.I. CONTROL.
2. FP NORMAL AT POS. 11 GRD. 17/18 1/4 FROM T3 ON "FR."
3. ALL CAMS HAVE 1/4 POS. OVERLAP EXCEPT AT STARTING POINTS WHICH HAVE 1/2 POS. OVERLAP.

NOTE 1

NOTE 2

S.D. 21193-011-012-013 SUBS. SDR. C.C.T.

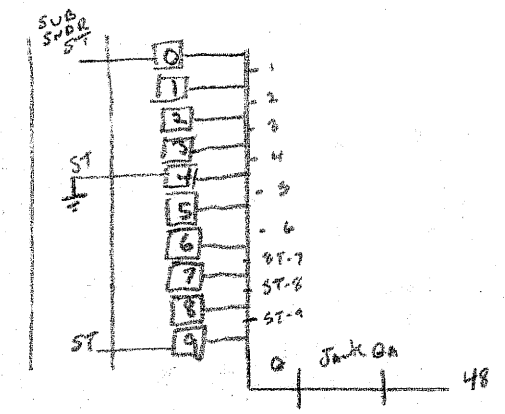
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

LINE PULSE CHART 486

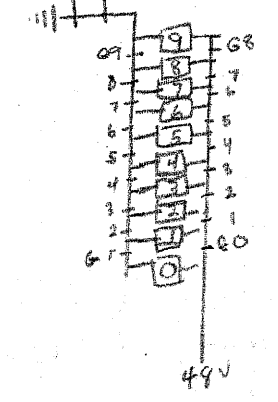
PANEL SYSTEM BATTERY CUT-OFF OS-331

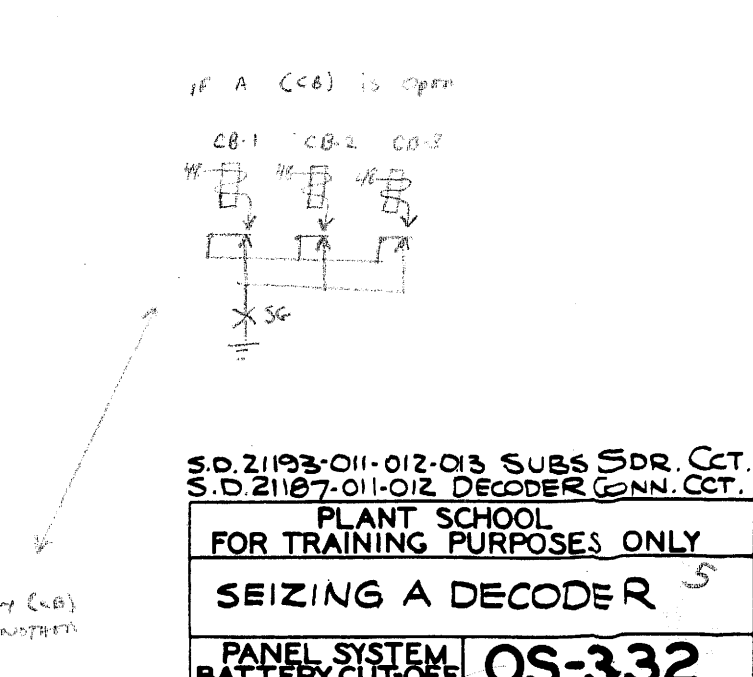
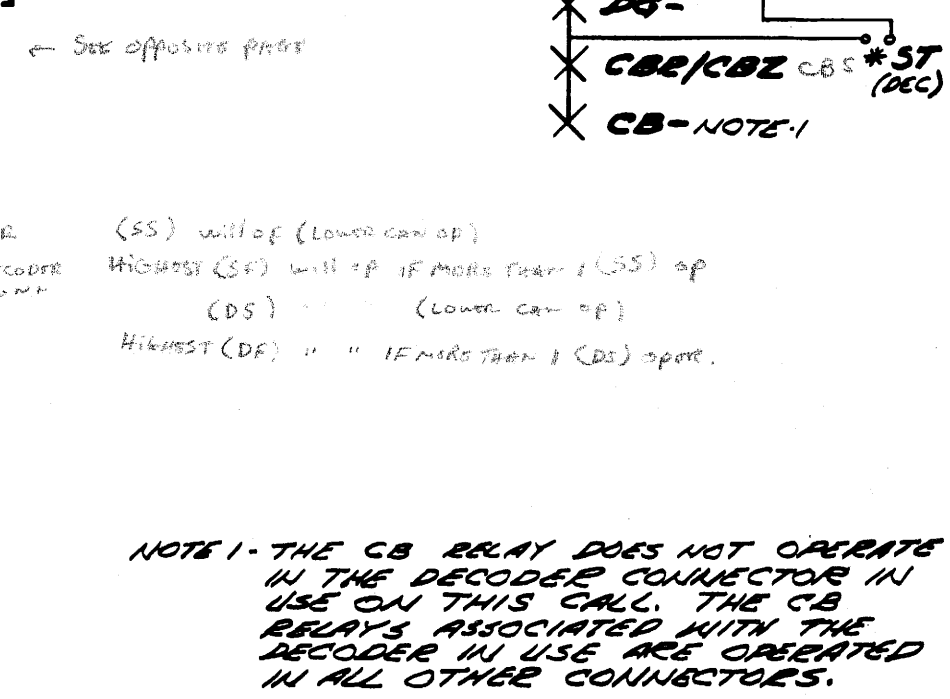
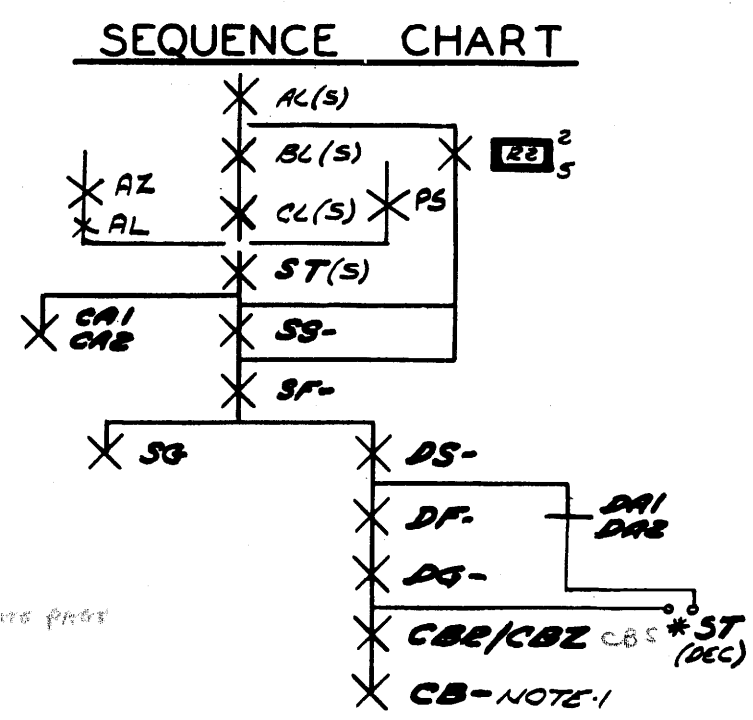
SHEET 4 OF 4

AUX SNOR LINK



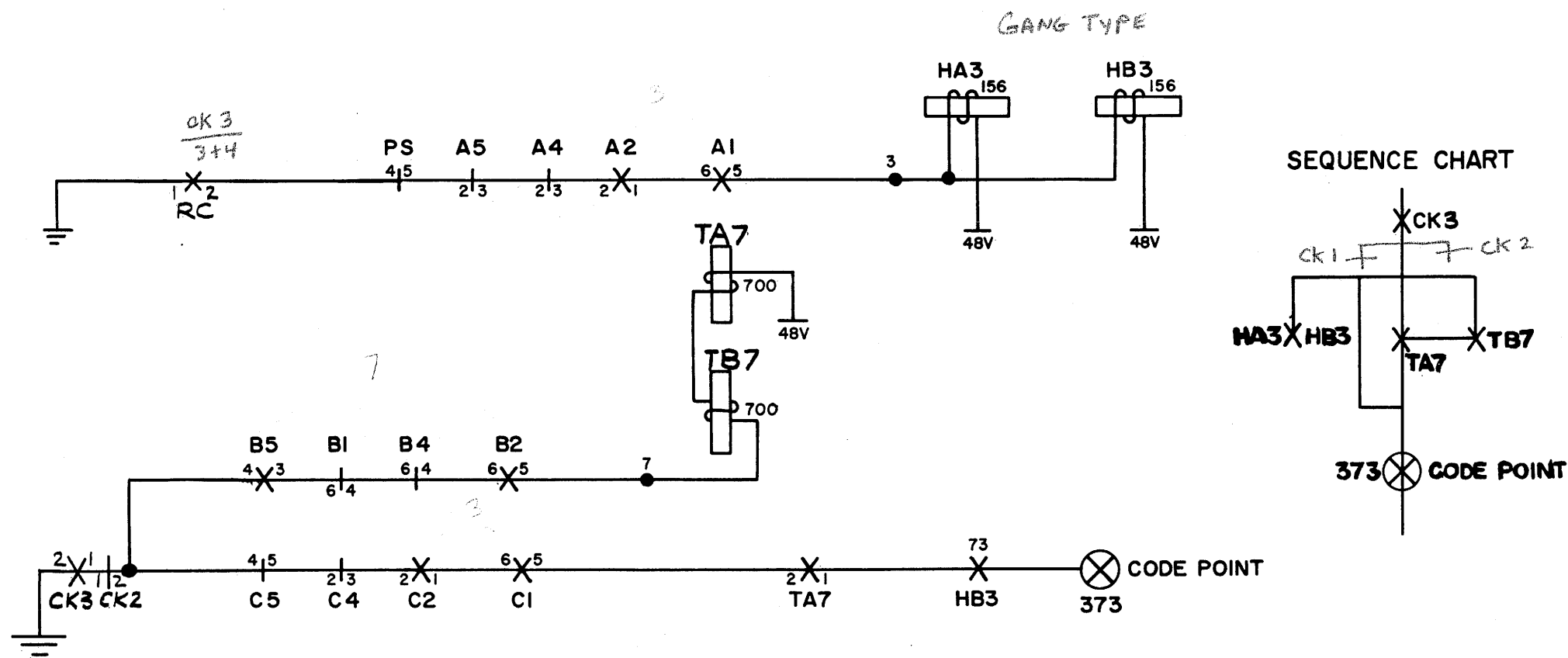
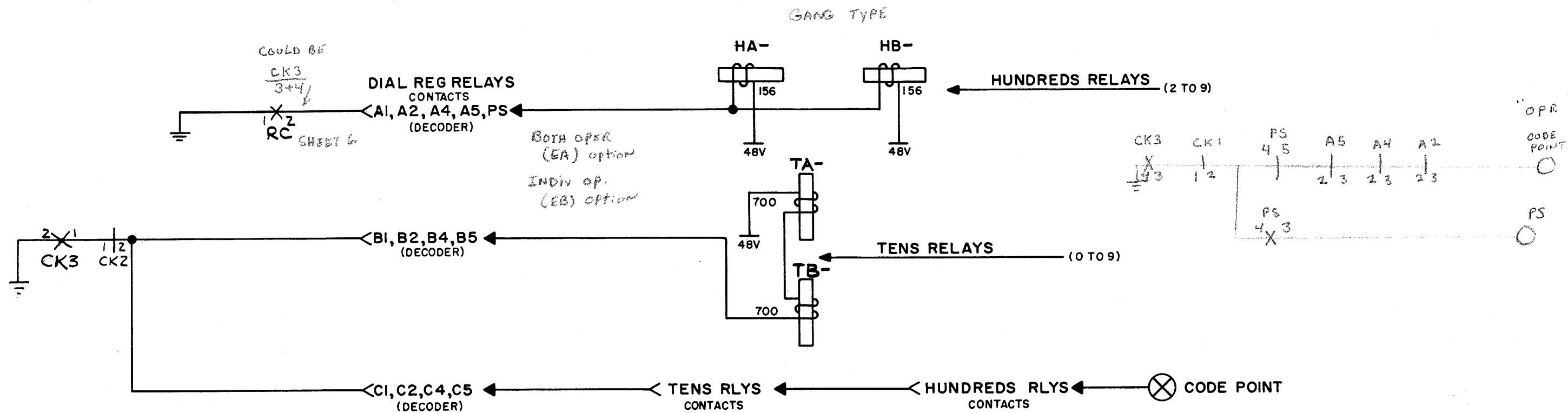
AP AP & Relays





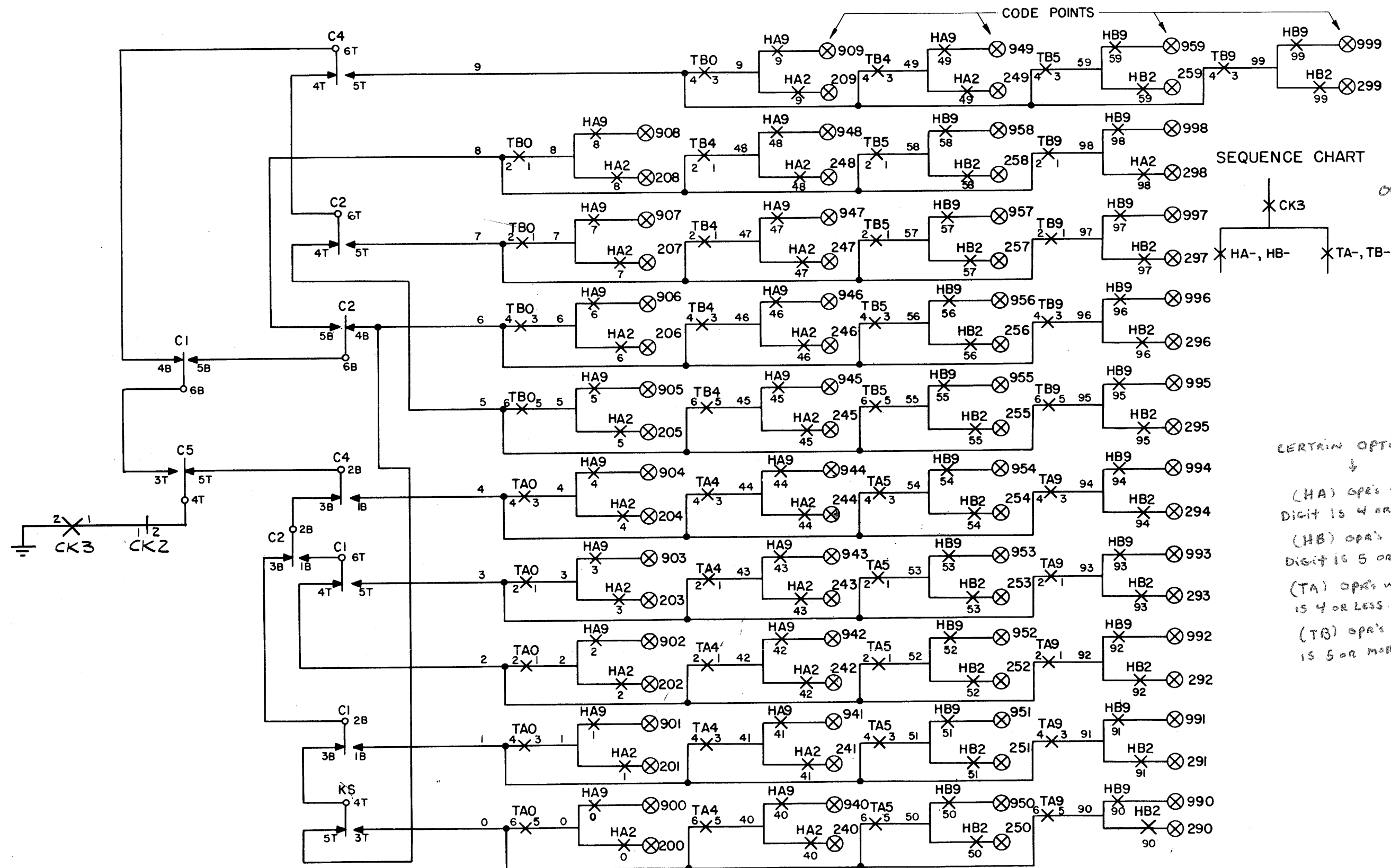


DATA RELAY 44
UNIT OF RELAY
SP 502 RELAY



S.D. 21277-011/019 DECODER C.C.T.

PLANT SCHOOL FOR TRAINING PURPOSES ONLY	
DECODER HA-HB, TA-TB RELAY OPERATION FOR GROUNDING CODE PT.	
PANEL SYSTEM BATTERY CUT-OFF	OS-334



CERTAIN OPTIONS

(HA) OPER'S WHEN 2nd DIGIT IS 4 OR LESS.(HB) OPER'S WHEN 2nd DIGIT IS 5 OR MORE.

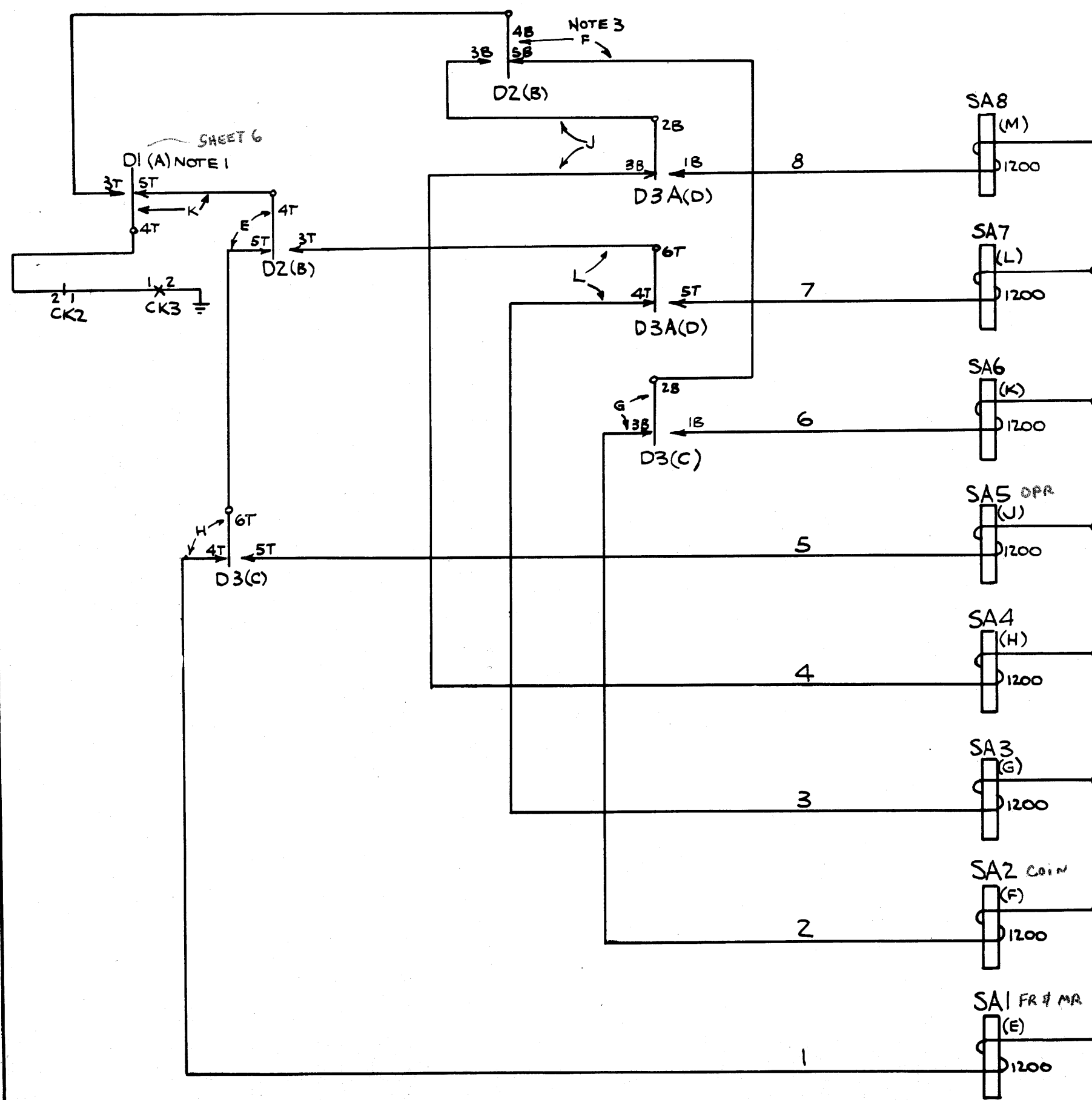
(TA) OPER'S WHEN "C" DIGIT IS 4 OR LESS.

(TB) OPER'S WHEN "C" DIGIT IS 5 OR MORE.

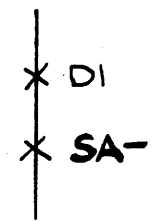
S.D. 21277-011/109 DECODER COT.

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
DECODER
GROUNDING A CODE POINTPANEL SYSTEM
BATTERY CUT-OFF

OS-335



SEQUENCE CHART



1. LETTERS IN PARENTHESIS DENOTE OPTIONAL APPARATUS
2. APPARATUS (A),(B),(C),(D),(E),(F),(G),(H),(J),(K),(L), AND (M) ARE FURNISHED AS REQUIRED TO DISTINGUISH THE VARIOUS CLASSES OF SERVICE SERVED BY THE OFFICE
TYPICAL USAGE OF RELAYS D1, D2, & D3 (FOR 5 CLASSES)

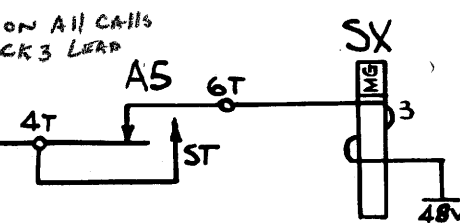
CLASS OF SERVICE	D-RELAY OPERATED	SA-RELAY OPERATED
~~FAST RATE~~ Non-Coin	NONE	SA1 - Non-Coin
~~MESSAGE RATE~~ Coin	D1 "FT" GRD FROM LINK	SA2 - Coin
PUBLIC COIN	D2 "FR" GRD FROM LINK	SA3
SEMI PUBLIC	D1, D2	SA4
OPERATOR	D3	SA5
3. WHEN ANY OF APPARATUS (A),(B),(C), OR (D) IS NOT FURNISHED, LOOP LEADS AT THE POSITIONS OF THE RELAYS NOT FURNISHED AS FOLLOWS.

APPARATUS OMITTED	A	B	C	D
LOOP LEADS DESIGNATED	K	E,&F	G,&H	J,&L

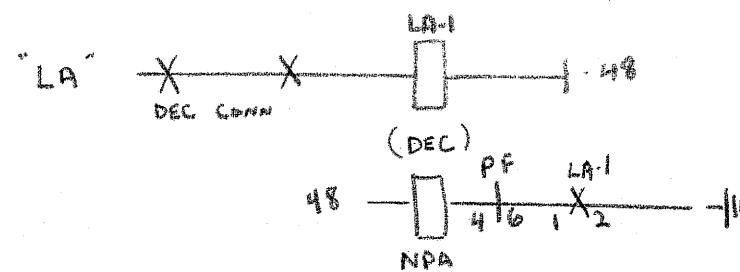
SA1 & SA2 ARE USED ONLY ON SPECIAL CODES
16; OPR - CAMA - ETC - VAC

OPR'S ONLY ON COIN CALLS FROM OPR'D (FT) IN SDR

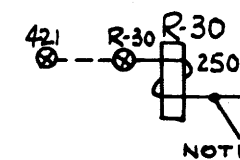
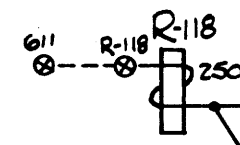
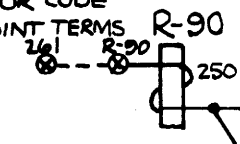
OPR'S ON ALL CALLS FROM CK3 LEAD



TS ⊗ FOR DIST POS 14 TLK CHG POS
DBP ⊗ TALK SEL-1



CODE GROUP
OR CODE
POINT TERMS



722

878

C POINT

R-24

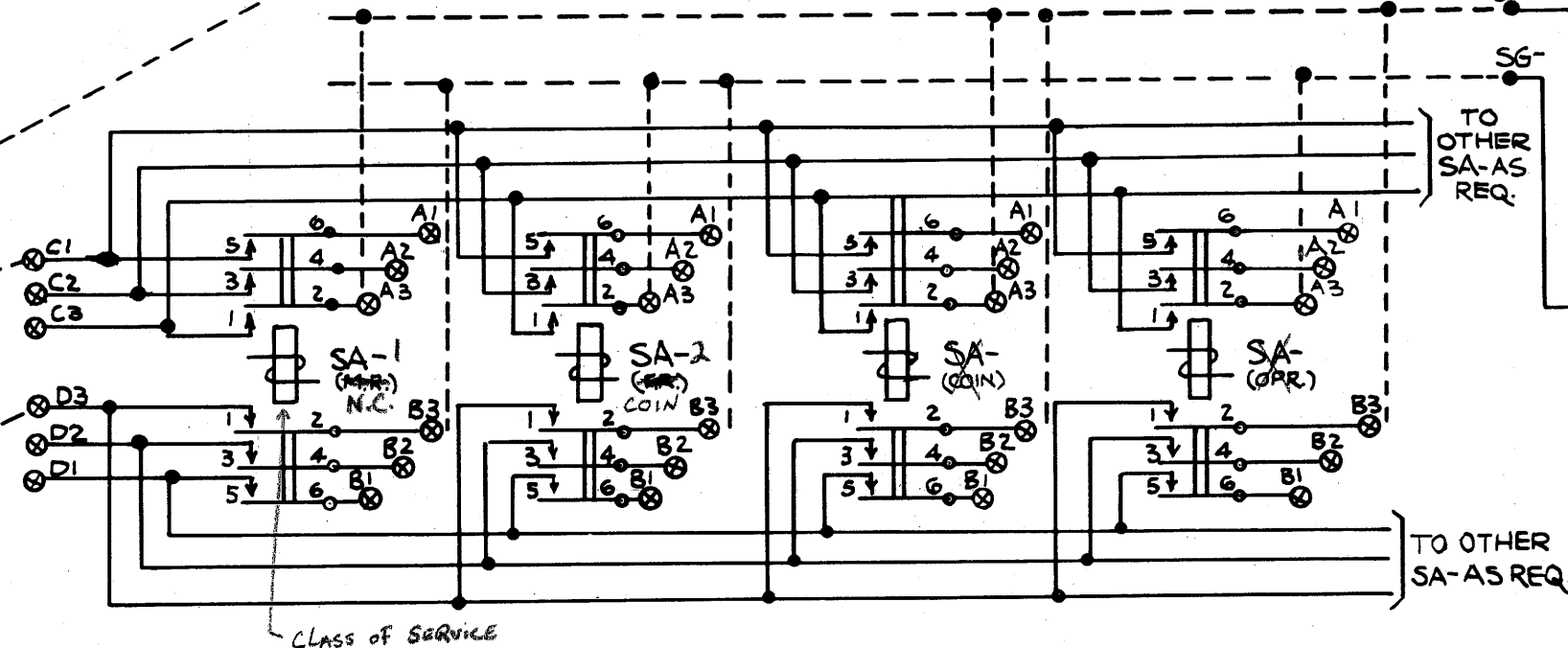
E

Z1

NPA

Z1

FOR TRAINING ONLY



SA-1 NON-COIN } USED ONLY ON SPECIAL CODES
SA-2 COIN } SUCH AS CAMA - OPR - VAC
- OTHERWISE CODE POINT WILL BE
WIRED TO (R) INSTEAD OF SA's.

NORM. CALL
PANEL
X-BAR

TS

RB

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

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SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

CD-21277
P.180

RA

RX

50

0.3

48V

TSA

551

971622

611

411

B

270

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

SG-

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SG-

TO PREVENT GND FROM FEEDING BACK
TO OTHER CODE POINT

NOTES

1. R RELAYS ARE STRAPPED IN GROUPS OF 5 PER E PUNCHING.
2. OPERATING CIRCUIT OF SA-RELAY SHOWN ON OS336
3. DOTTED LINES ARE CROSS CONNECTIONS.
4. FOR OTHER CROSS CONNECTION DATA SEE BSP SECT. A 362.007

BSP 215-141-301

S.D.21277-011/D19 DECODER

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

OPERATION OF
ROUTE RELAYS 10

PANEL SYSTEM
BATTERY CUT-OFF 05-337

ISSUE H-3-50

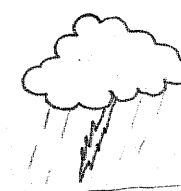
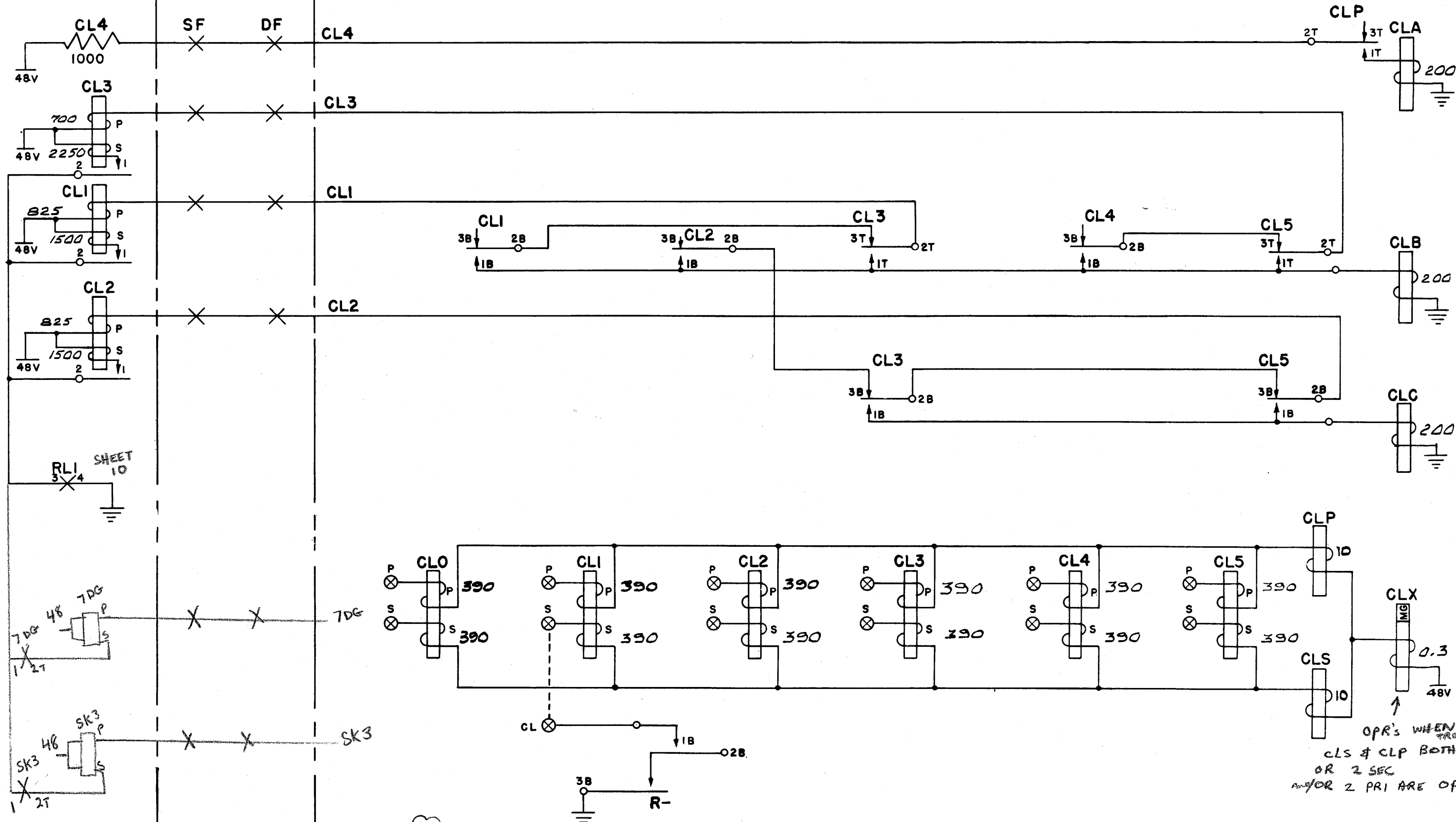
SENDER

DECODER CONNECTOR

SEE OS 6N
OR
11B

DECODER

11A

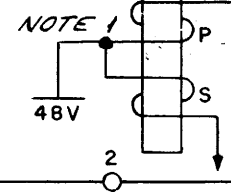


S.D. 21277-011/019 DECODER C.C.T.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
DECODER 11-A
TRANSMITTING CLASS INFORMATION
PANEL SYSTEM BATTERY CUT-OFF **OS-338**

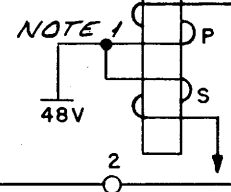
SENDER

MTC IN SOR
WILL BE
USED

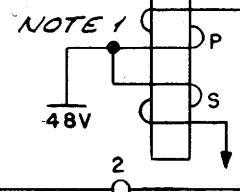
CR5



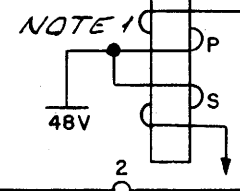
CR4



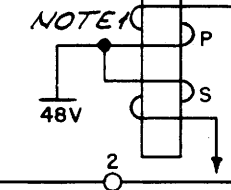
CR2



CR3



CRI



RLI

DECODER
CONNECTOR

S F

D F

MTC
FOR TT
CR5

DECODER

(MTC) FOR PANEL, X-BAR, FULL SELECTOR
& FOR X-BAR, TANDM WHERE LOOP $\Omega = 1300 \Omega$ OR LESS(TG) IS USED ON ALL PANEL & X-BAR TRUNK GROUPS
WHERE LOOPS ARE OVER 1300 Ω AND ALL OTHER
TRUNK GROUPS REGARDLESS OF RES. BSP 215-141-301 P. 2.75 & 2.76

CR4

CR2

CR3

CRI

CRO - CR9
P WINDING - 390
S WINDING - 390

CR

2 3

R-

CRP

2T

3T

1T

CRA

200

CRB

200

CRC

200

CRP

10

CRX

0.3

48V

CRS

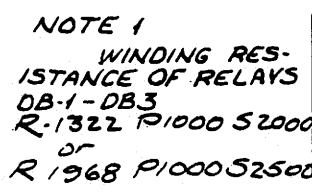
10

NOTE 1
PRIMARY AND
SECONDARY WINDING
RESISTANCE CRI -
CR5
R-1246 P1000 S3000
or
R1967 P1000 S2500

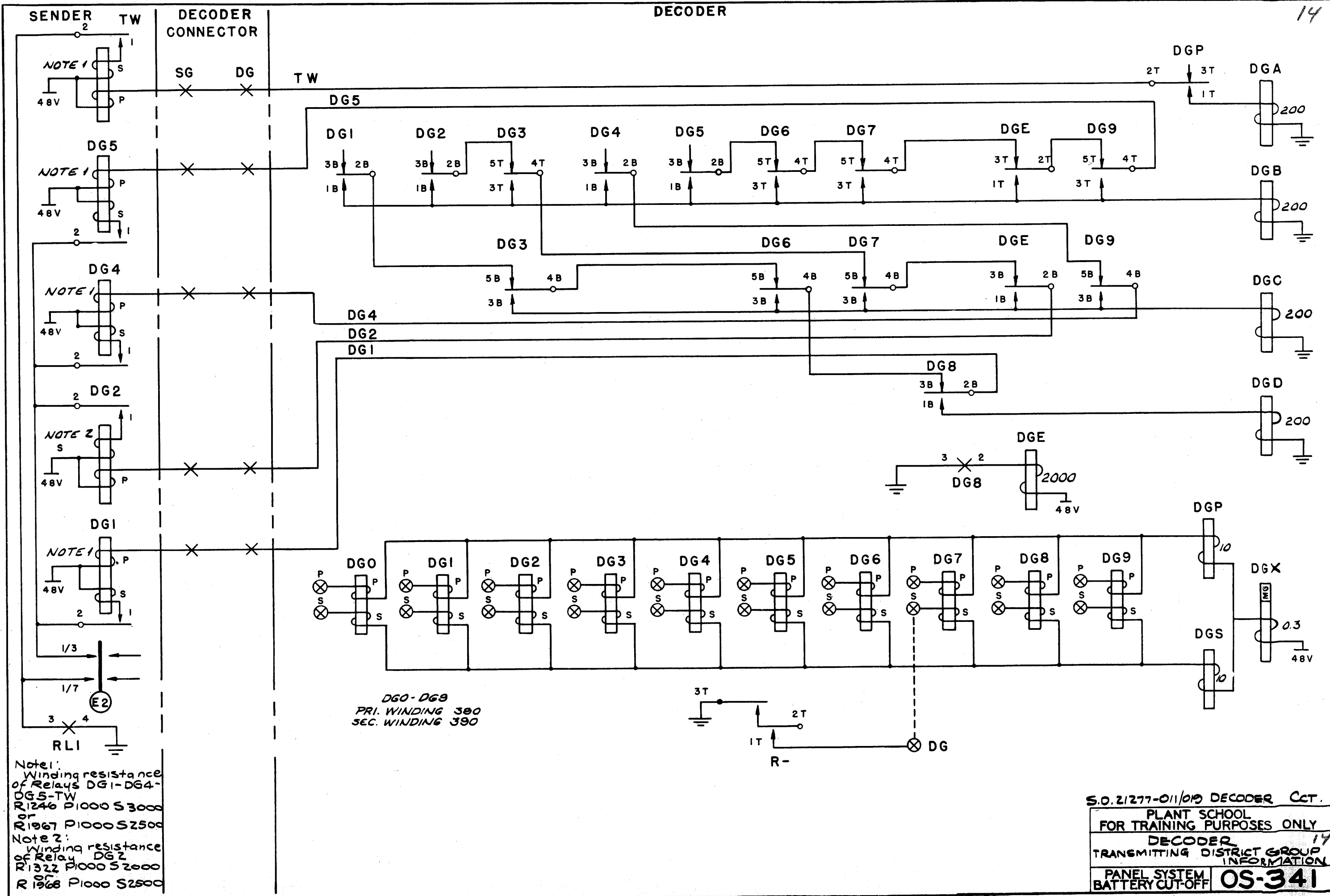
S.D. 21277-011/019 DECODER CCT.

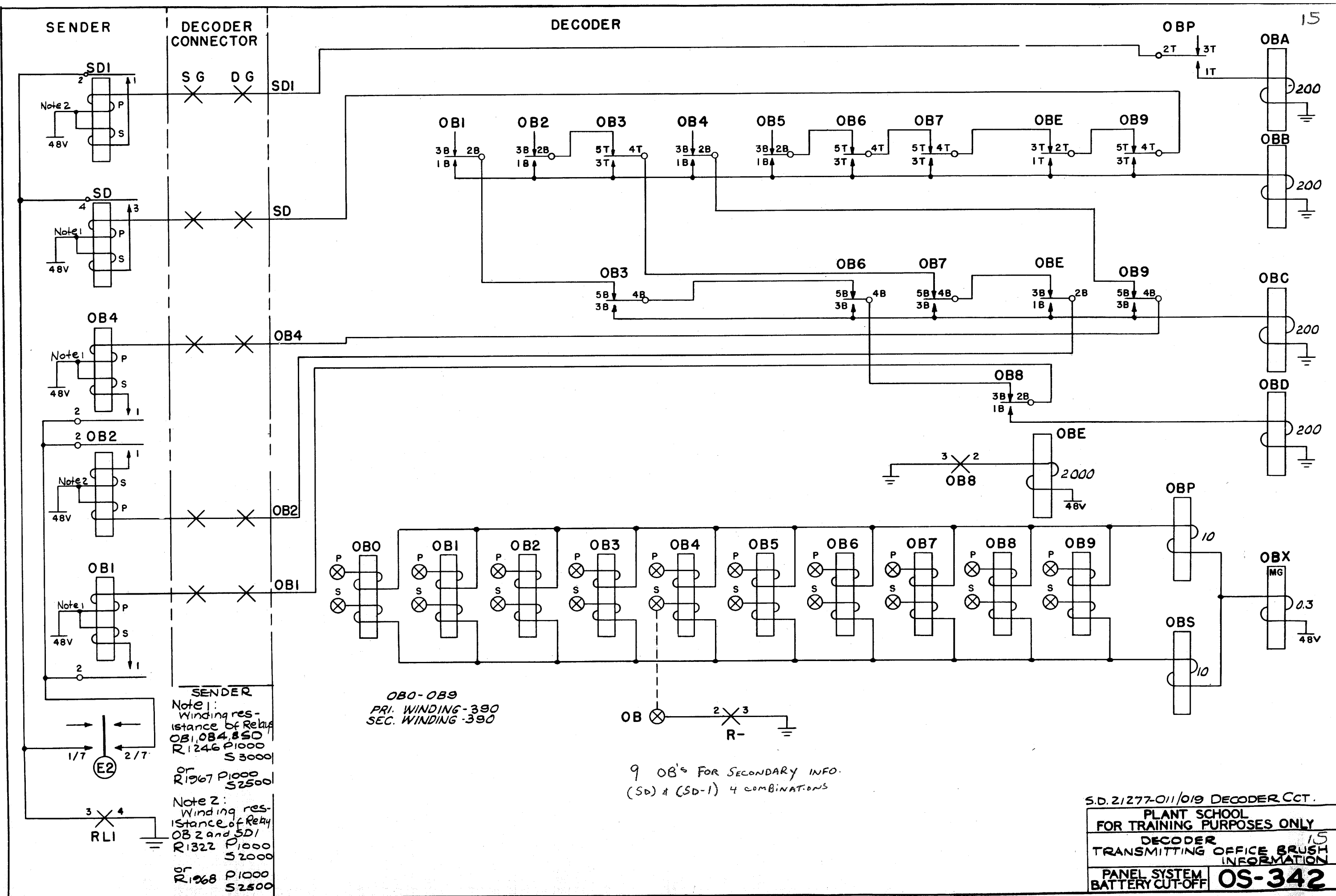
PLANT SCHOOL
FOR TRAINING PURPOSES ONLYDECODER
TRANSMITTING COMPENSATING
RESISTANCE INFORMATIONPANEL SYSTEM
BATTERY CUT-OFF

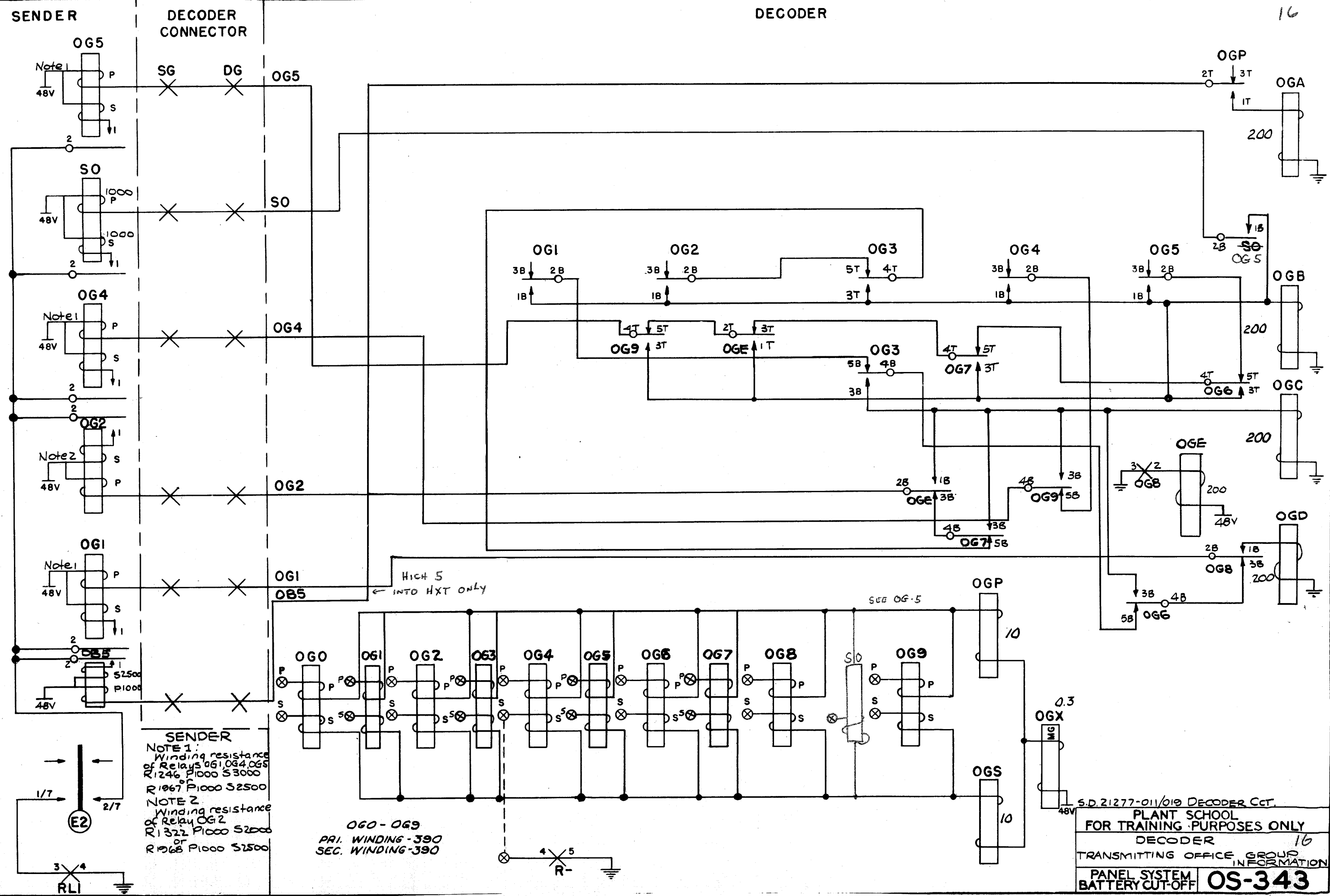
OS-339



S.D. 21277-011/019 DECODER C.T.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
DECODER
TRANSMITTING DISTRICT BRUSH
INFORMATION
PANEL SYSTEM
BATTERY CUT-OFF
OS-340





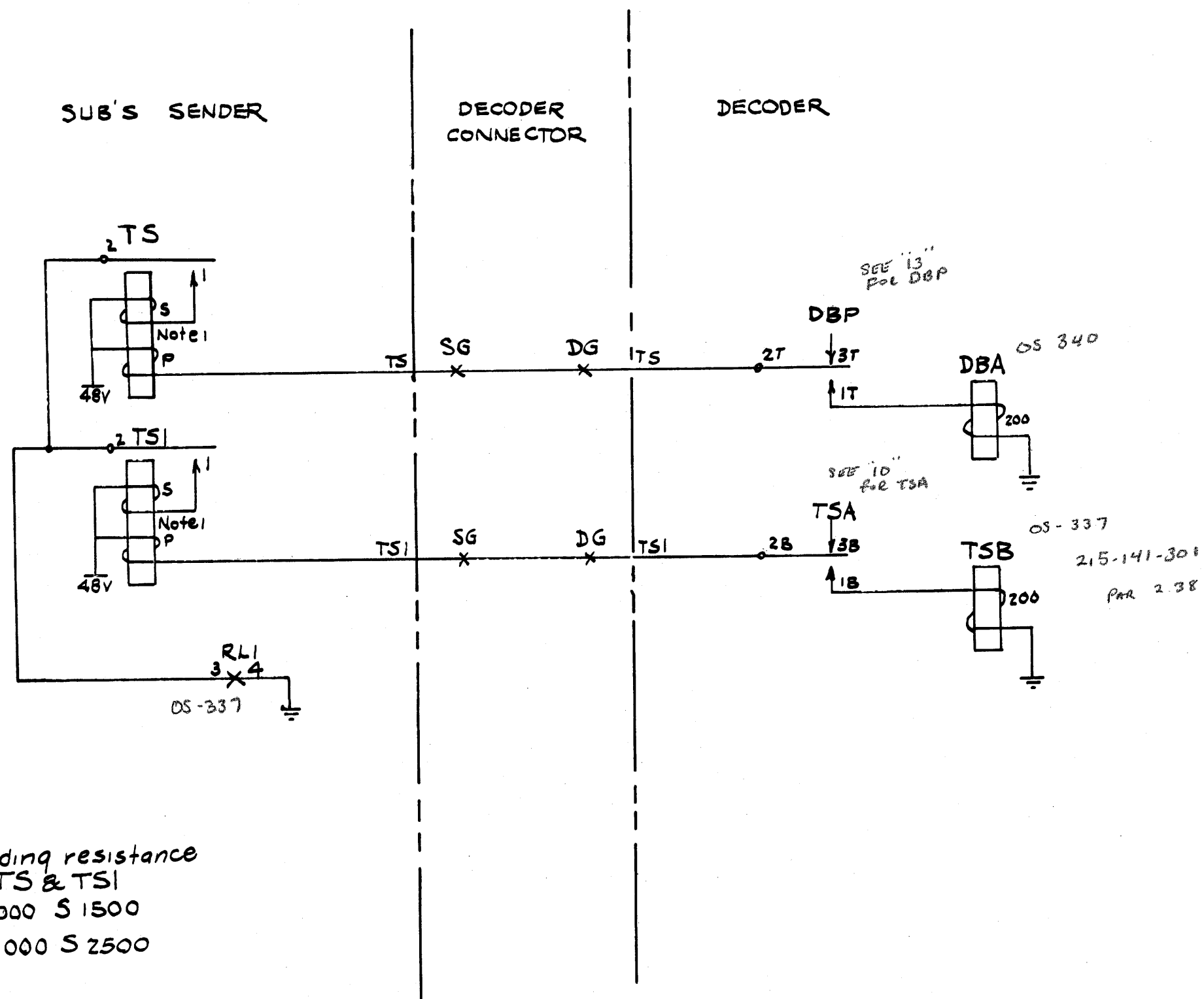


ISSUE 11-3-50

SENDER
NOTE 1:
Winding resistance
of Relays OG1, OG4, OG5
R1246 P1000 S3000
R1067 P1000 S2500
NOTE 2:
Winding resistance
of Relay OG2
R1322 P1000 S2500
or
R1068 P1000 S2500

OG0 - OG9
PRI. WINDING - 390
SEC. WINDING - 390

S.D. 21277-011/019 DECODER Cct.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
DECODER
TRANSMITTING OFFICE GROUP
INFORMATION
PANEL SYSTEM
BATTERY CUT-OFF
OS-343



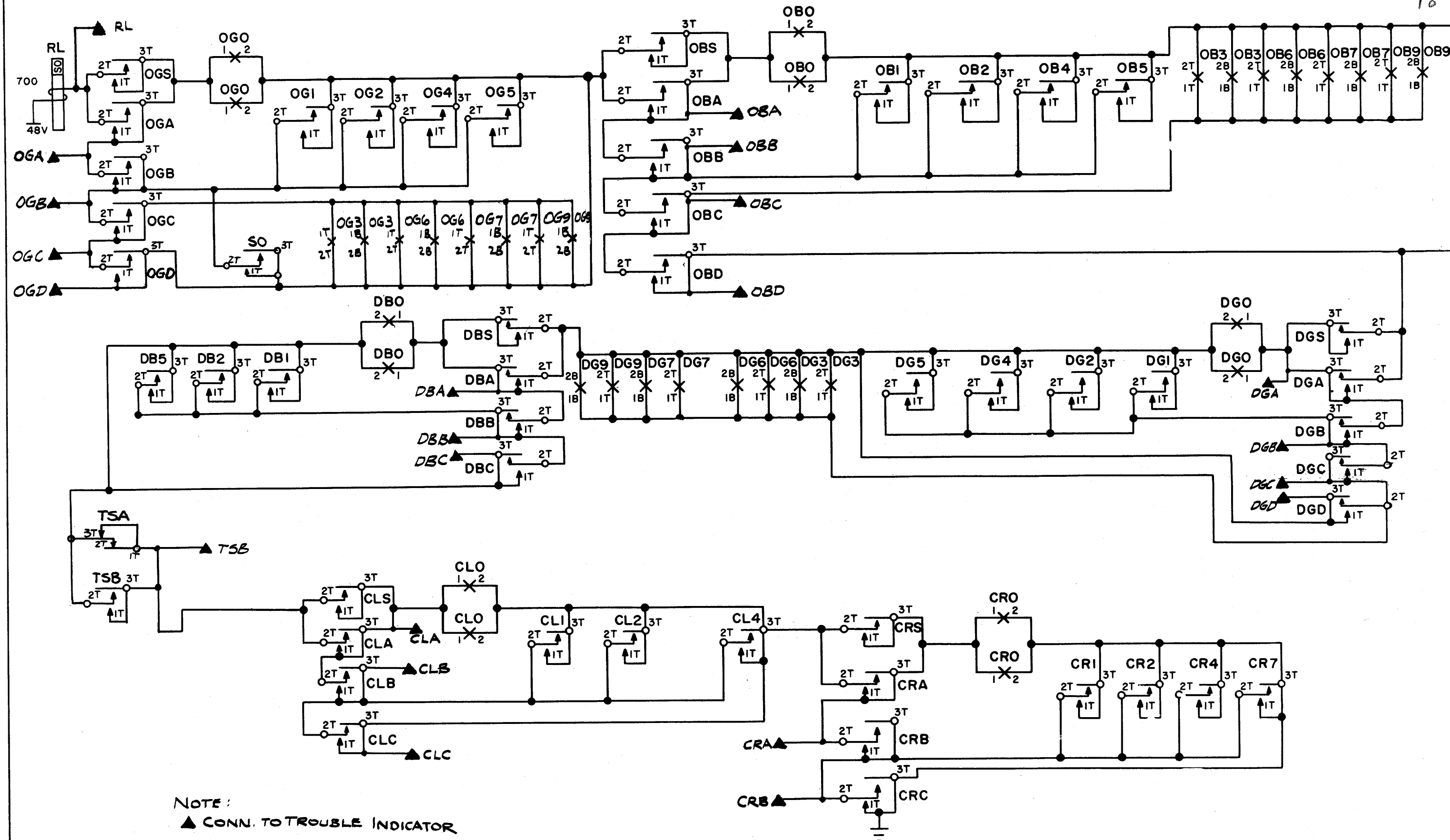
Note 1: Winding resistance
at relays TS & TSI
EG451 P1000 S1500
or
R1966 P1000 S2500

S.D. 21277-011/019 DECODER COT.

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

DECODER
TRANSMITTING TALK SELECTION
INFORMATION

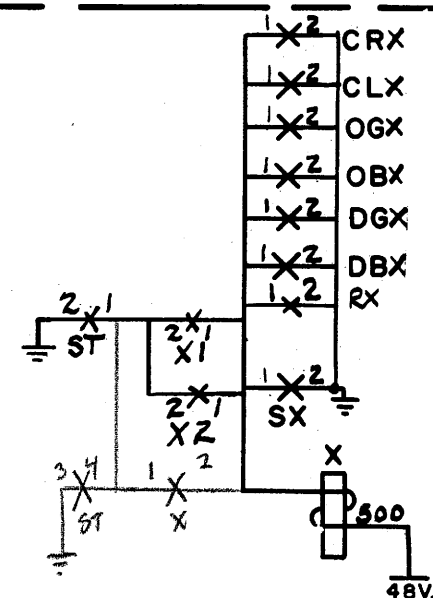
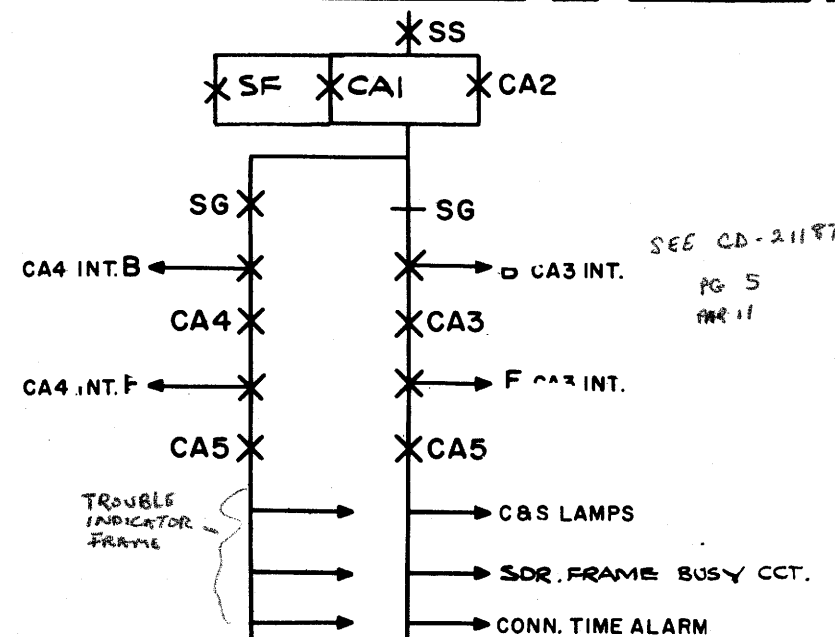
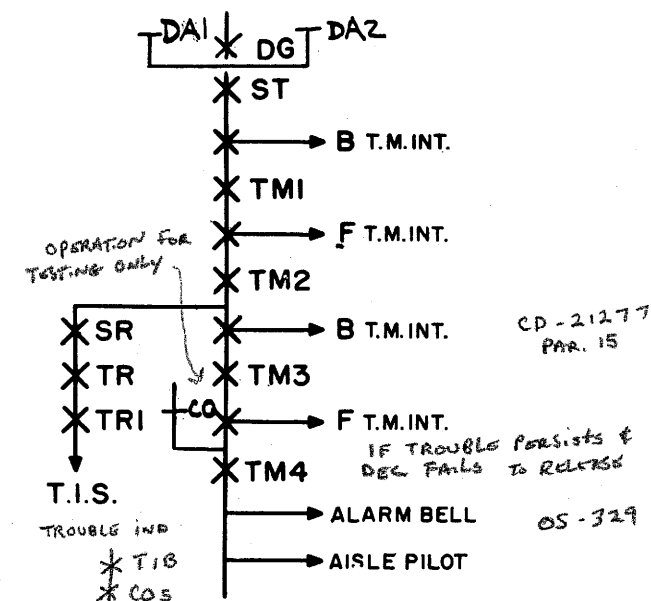
PANEL SYSTEM
BATTERY CUT-OFF OS-344



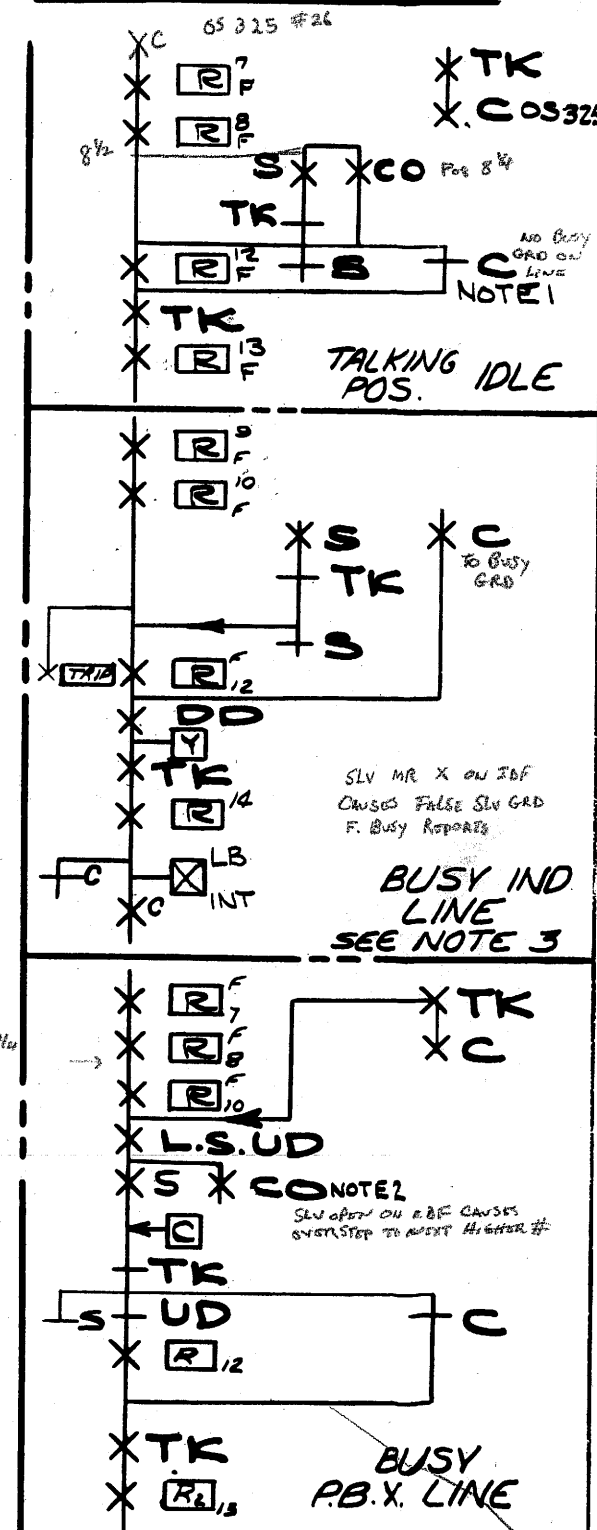
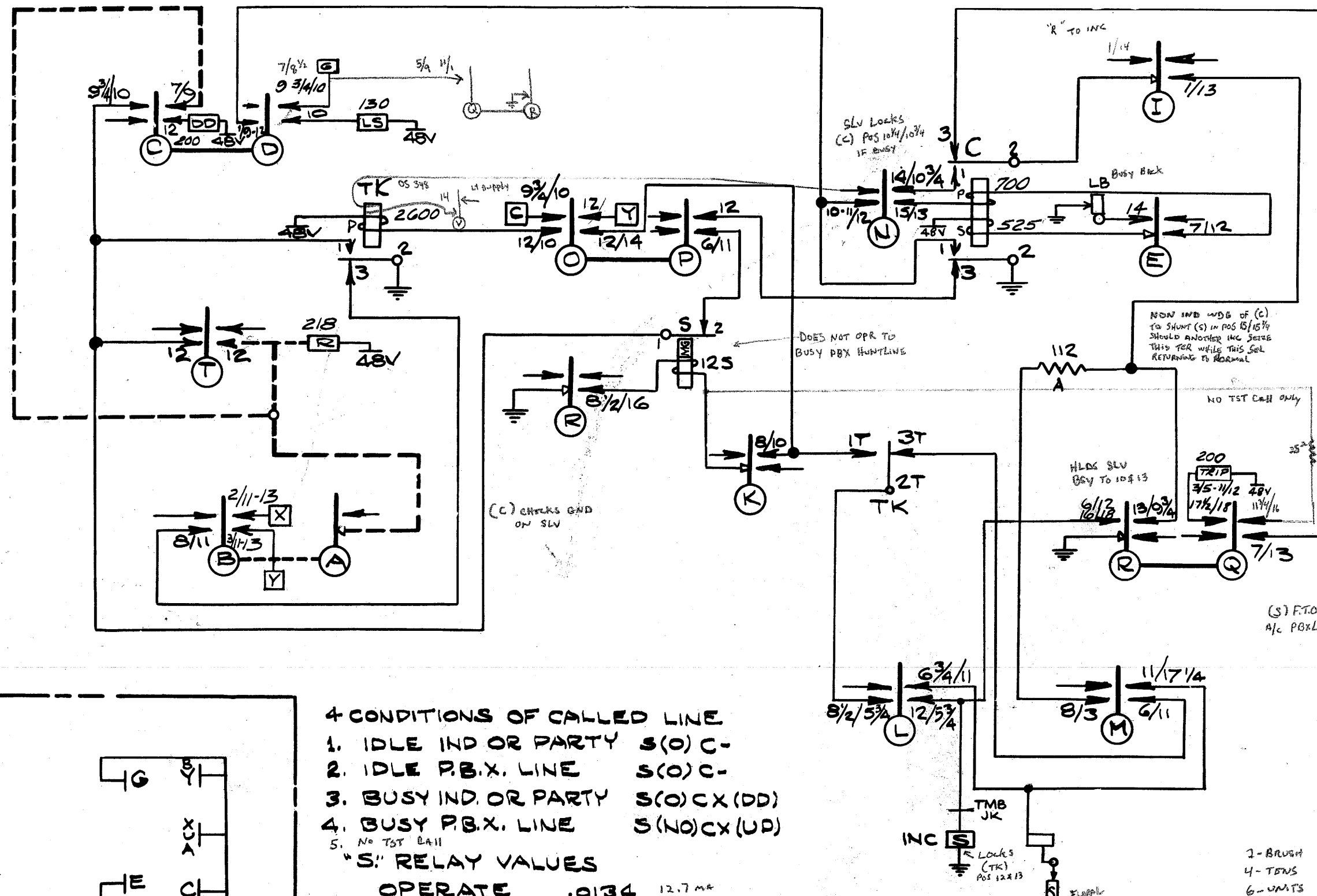
NOTE:
▲ CONN. TO TROUBLE INDICATOR

S.D.21277-011/012 DECODER CCT.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
DECODER
CHECK OF TRANSMITTING LEADS
AND RELEASE
PANEL SYSTEM
BATTERY CUT-OFF OS-345

ISSUE 1
JAN 1950



PANEL SYSTEM BATTERY CUT-OFF	OS-346
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COMM STRAPPING

- #### 4 CONDITIONS OF CALLED LINE
1. IDLE IND OR PARTY S(O) C-
 2. IDLE P.B.X. LINE S(O) C-
 3. BUSY IND OR PARTY S(O) CX (DD)
 4. BUSY P.B.X. LINE S(NO) CX (UD)

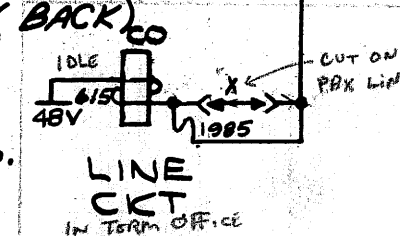
5. No TST call

"S" RELAY VALUES

OPERATE .0134 12.7 m4
 NO-OPERATE .012

NOTES- (C STILL OPERATED POS. 12 BUSY BACK)

1. "C" RELEASES WHEN SWITCH PASSES 10/4.
2. "S" OPER. ON AN IDLE ID OR IDLE
LAST LINE OF PBX. ONLY
3. IF AN IDLE LINE IS FOUND C RELEASES.



2 - BUNCH
4 - TENS
6 - UNITS

SLV Conditions

SO 48V IDLE LINE
GRD + 3V = 85Y PBX (S)
GRD + 8V = 85Y IND (S)

SD.21200-01 FINAL CCT.

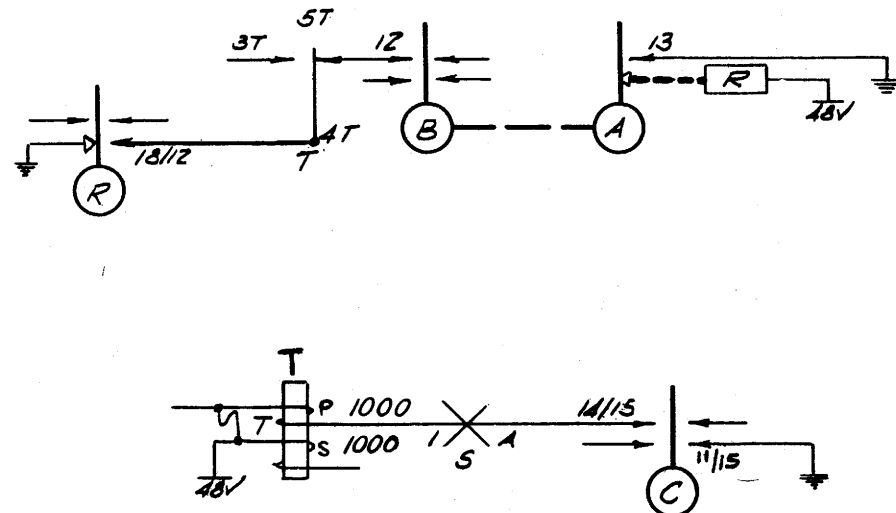
**PLANT SCHOOL/
FOR TRAINING PURPOSES ONLY**

LINE TESTING

PANEL SYSTEM BATTERY CUT-OFF	OS-347
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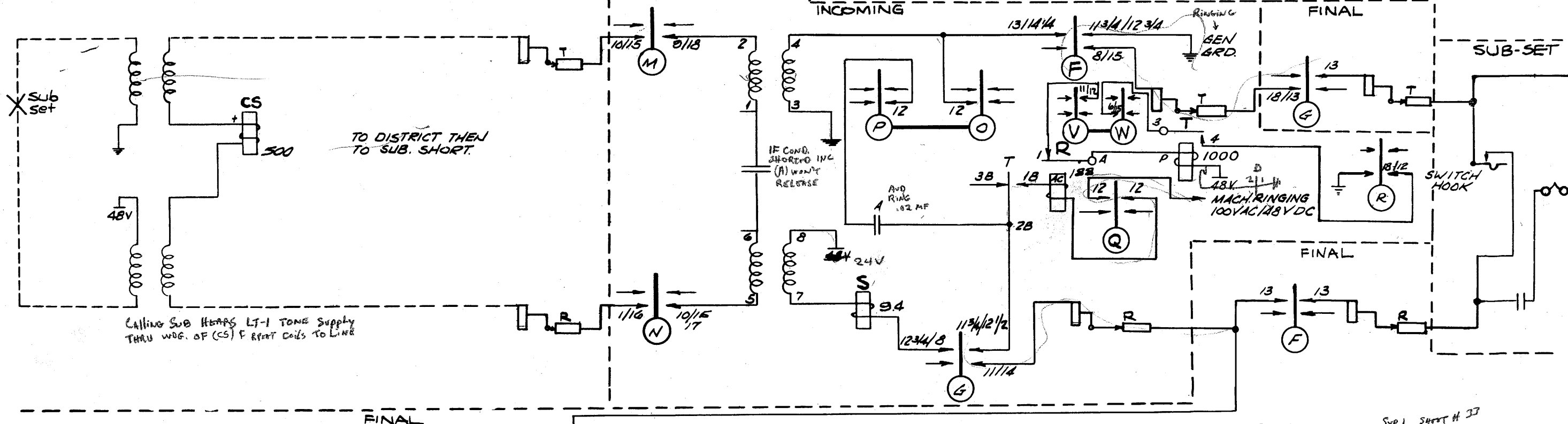
(A)(D)(T) IN INC

INCOMING



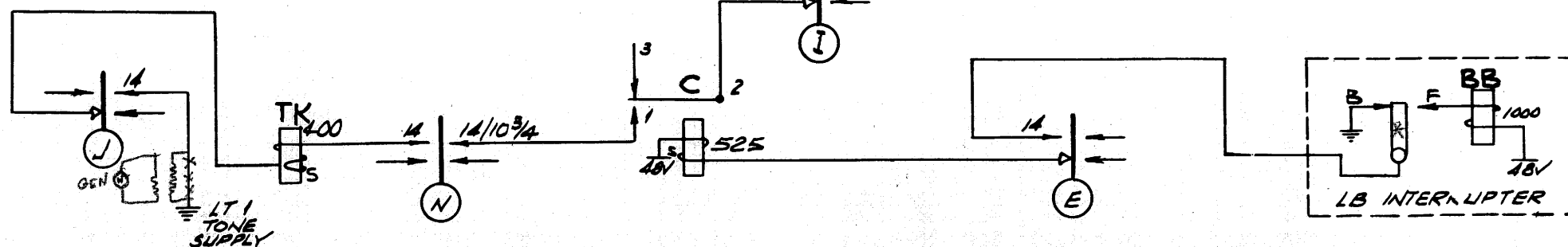
NOTES:

1. WHEN SUB. ANSWERS
2. "C" FLASHES ON B.B. SIGNAL
3. "CS" OPERATES ON REV. BATT. FROM TRK. CKT.



Calling Sub Heaps LT-1 TONE Supply THRU WDG. OF (CS) F RENT COILS TO LINE

FINAL

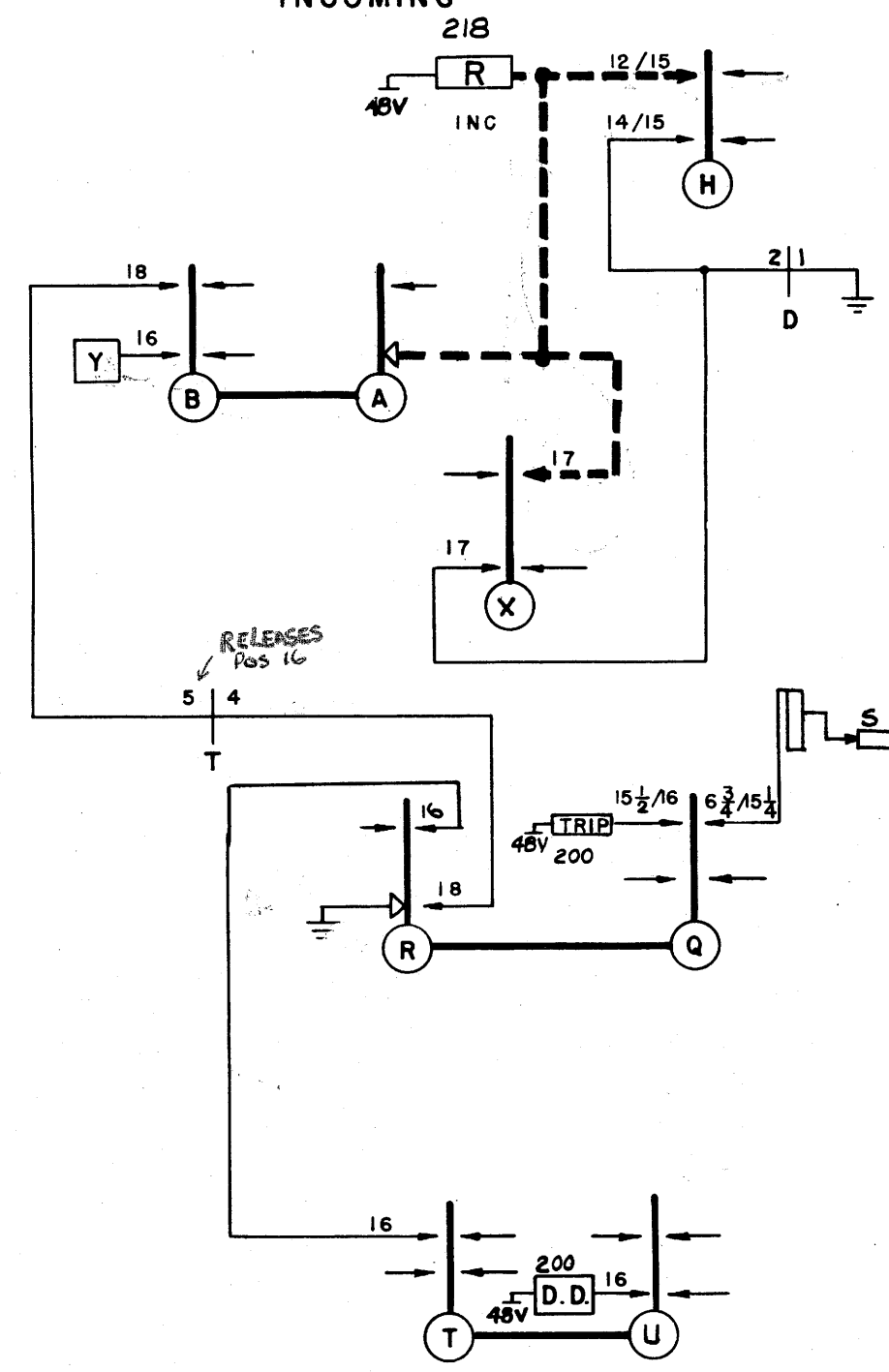


1 PER SIDE OF FRAME
DETECTS FALSE GRD
ON SWITTING CONT
OF LB INT

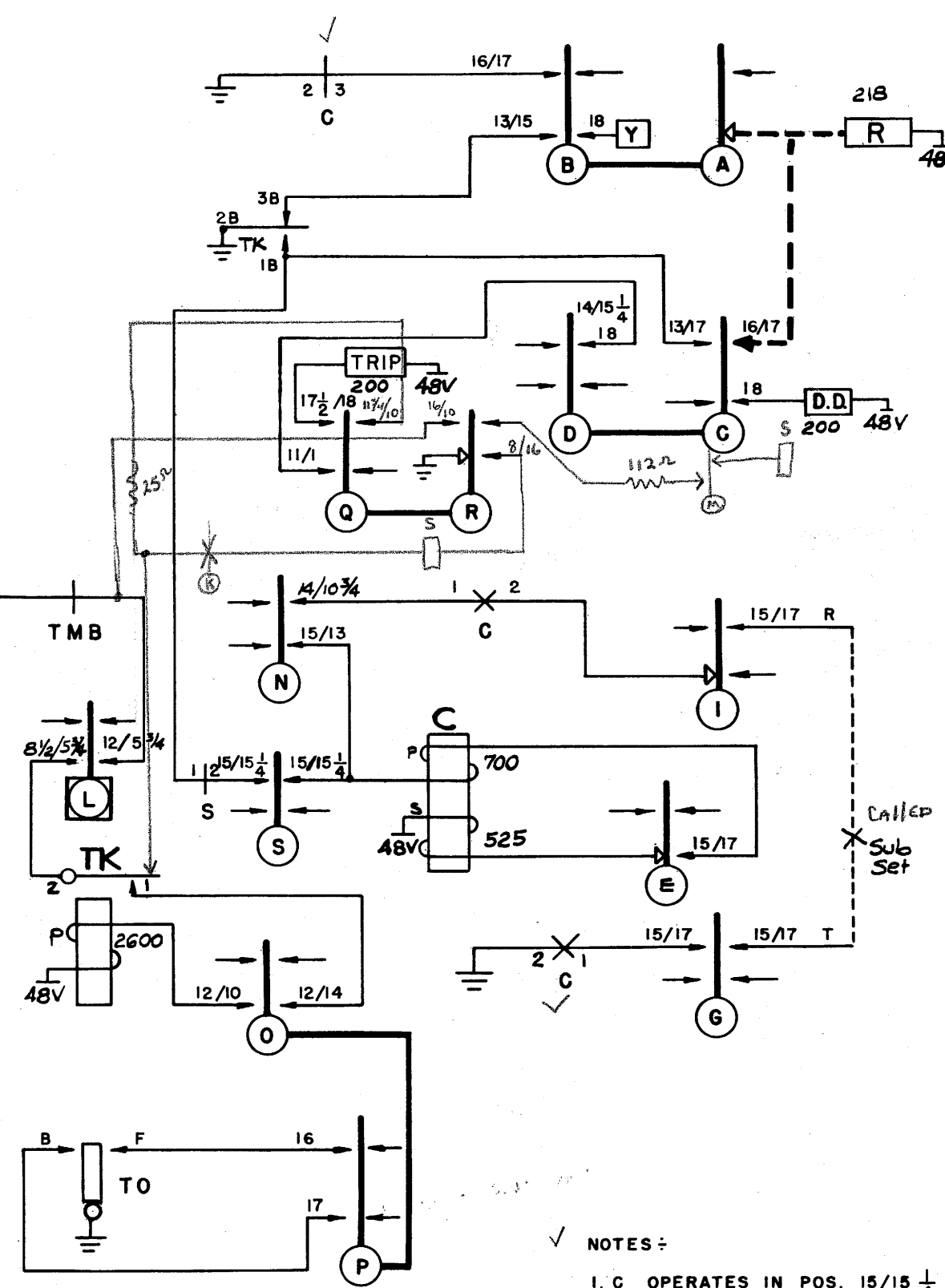
Sup 1 SHEET # 27

S.D. 21115-011 INC. CCT.
S.D. 21200-01 FINAL CCT.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
RINGING AND TRIPPING 30
PANEL SYSTEM BATTERY CUT-OFF **OS-348**

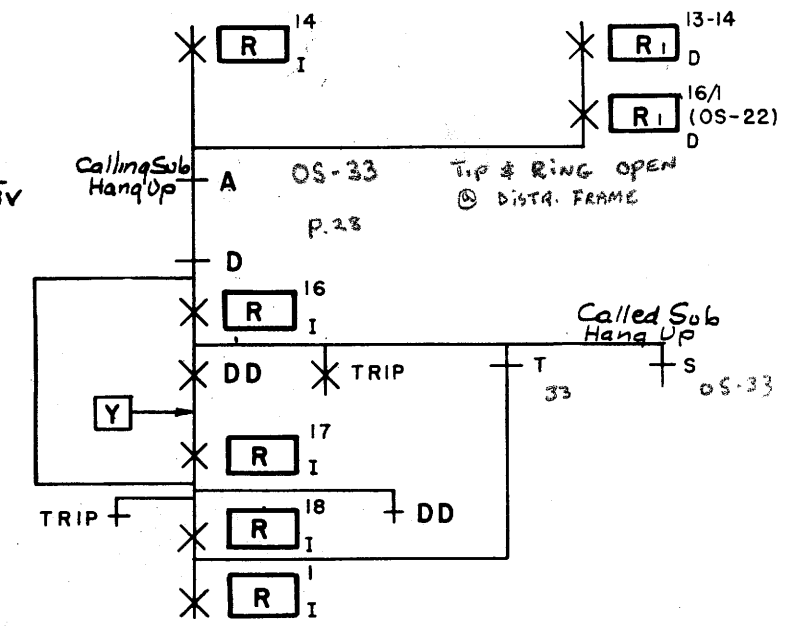
INCOMING



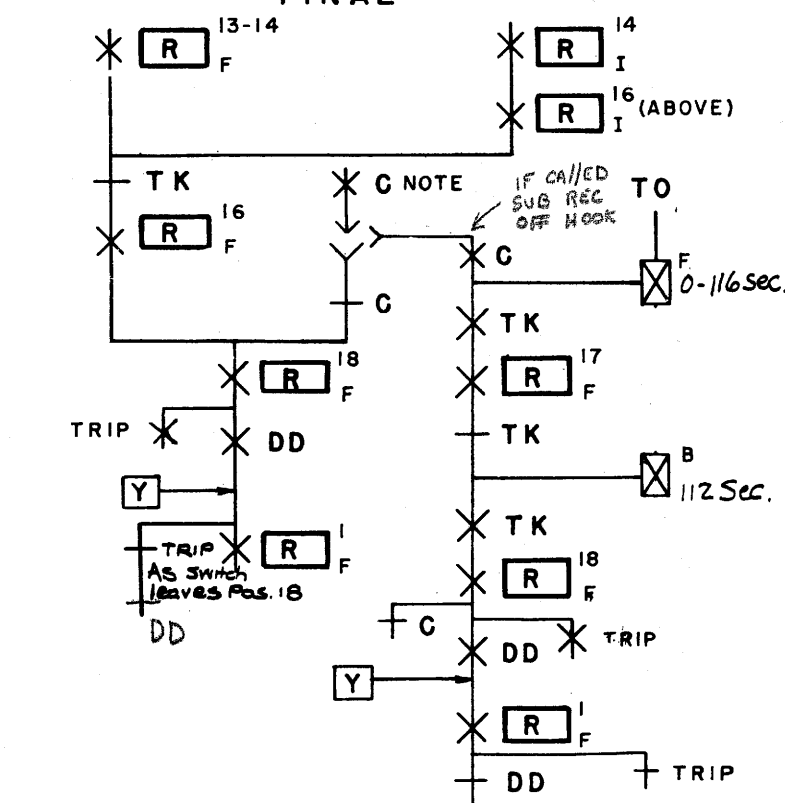
FINAL



INCOMING



FINAL



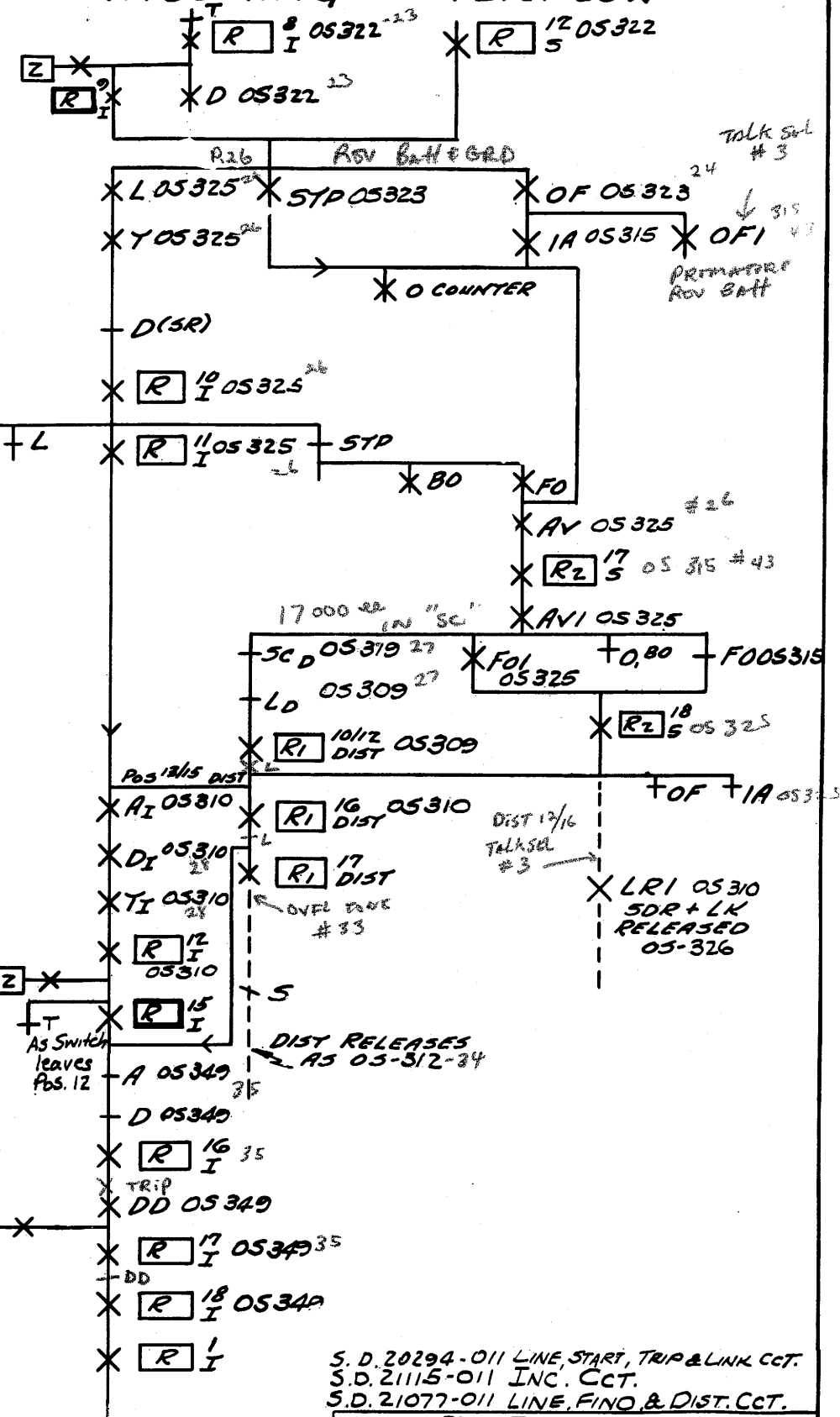
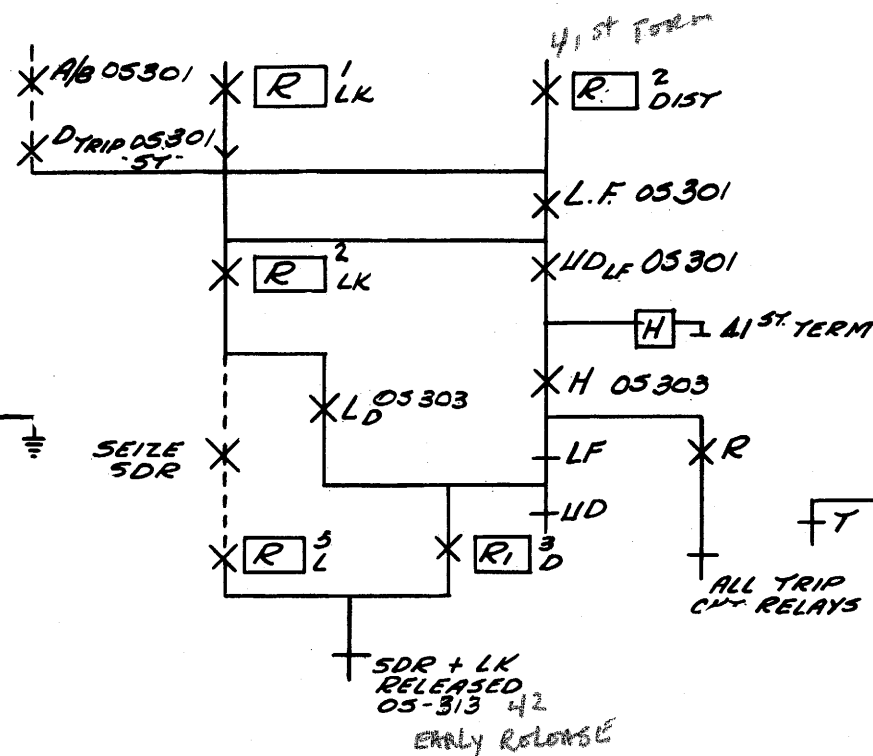
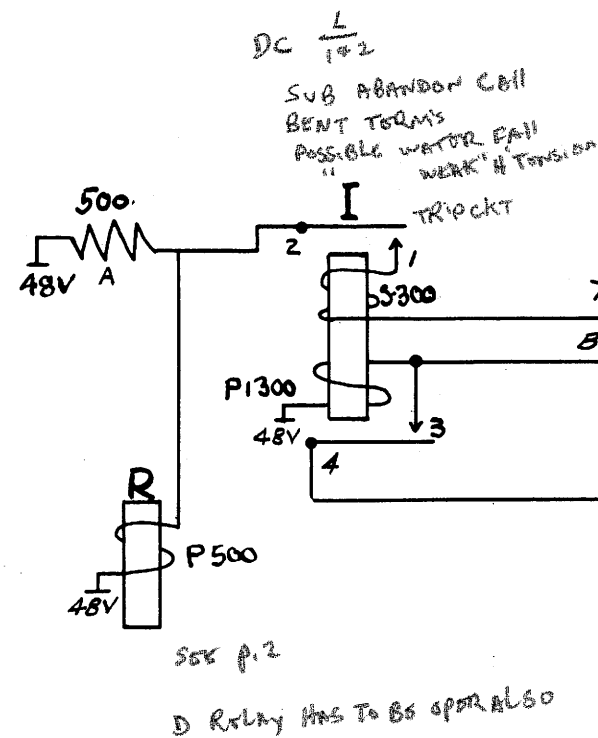
NOTES:
1. C OPERATES IN POS. 15/15 1/4
AND LOCKS TO POS. 17 IF R.O.H. ← OFF
OTHERWISE C RELEASES IN
POS. 16

S.D. 21115-011 INC. CCT.
S.D. 21200-01 FINAL CCT.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
RELEASE OF INCOMING 35
AND FINAL
PANEL SYSTEM
BATTERY CUT-OFF **OS-349**

ISSUE
11-6-50

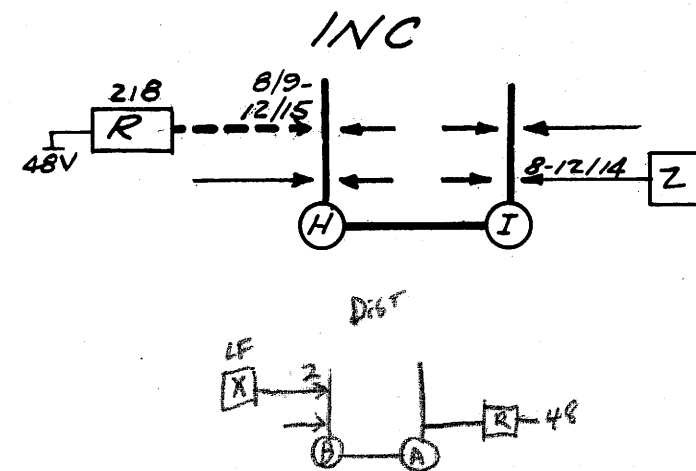
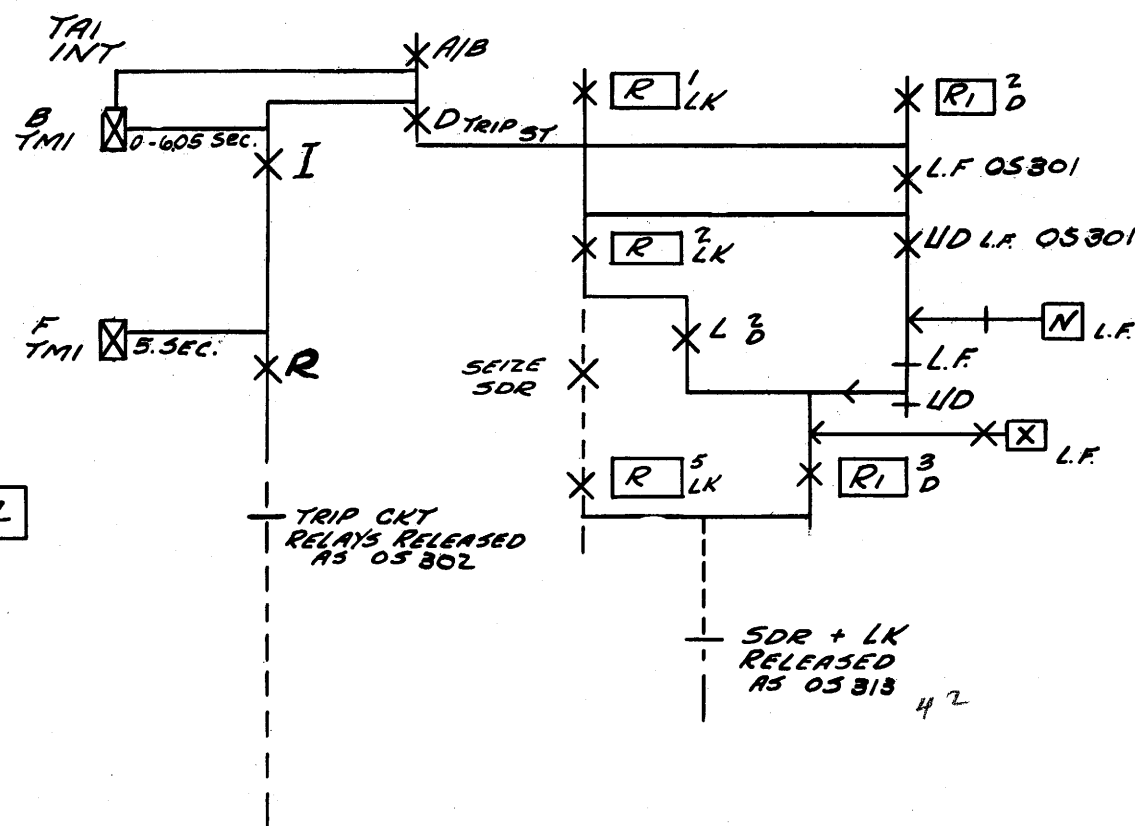
LINE FINDER OVERFLOW

INCOMING OVERFLOW



LINE FINDER TELL TALE

TRIP TIME ALARM



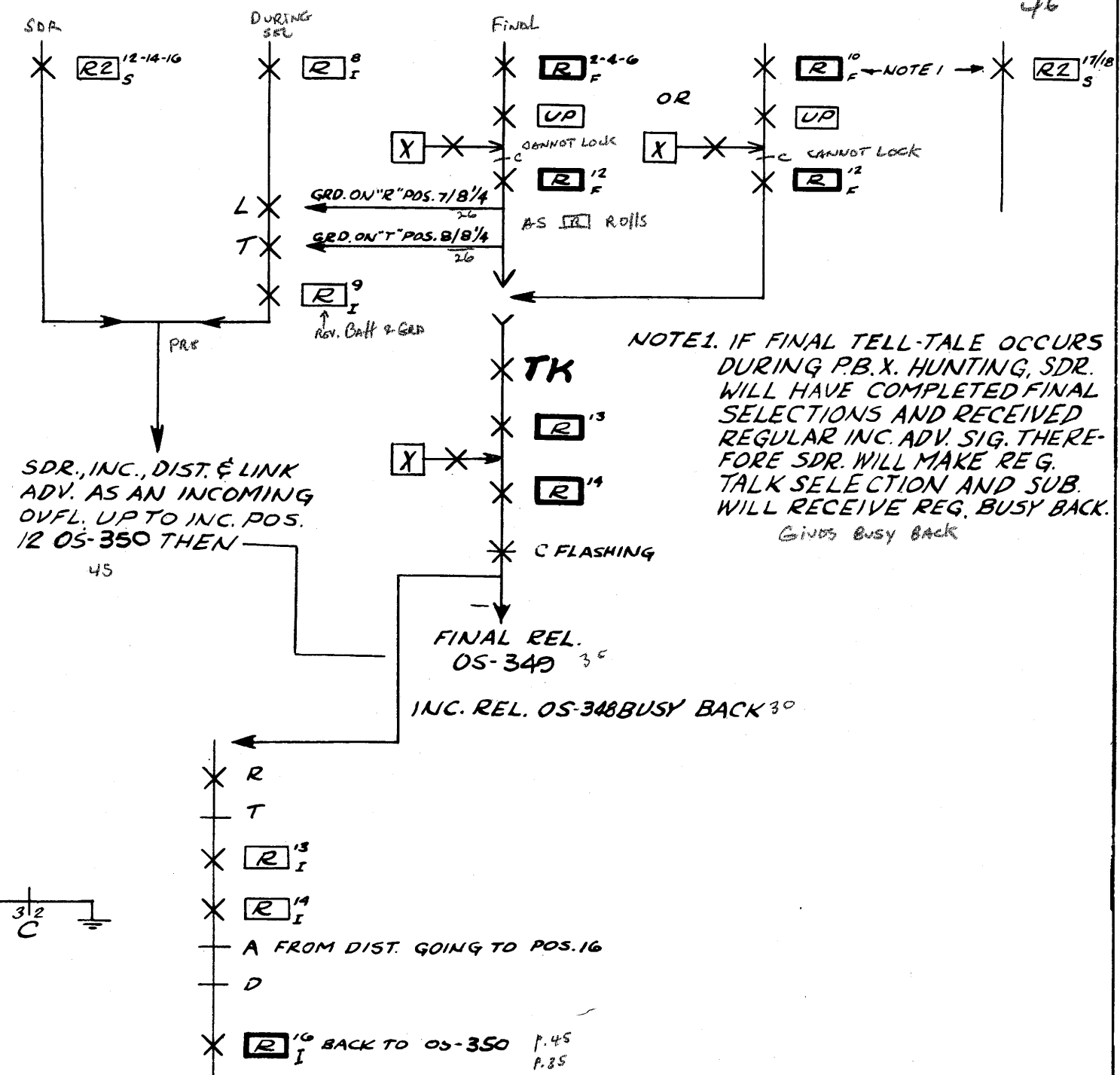
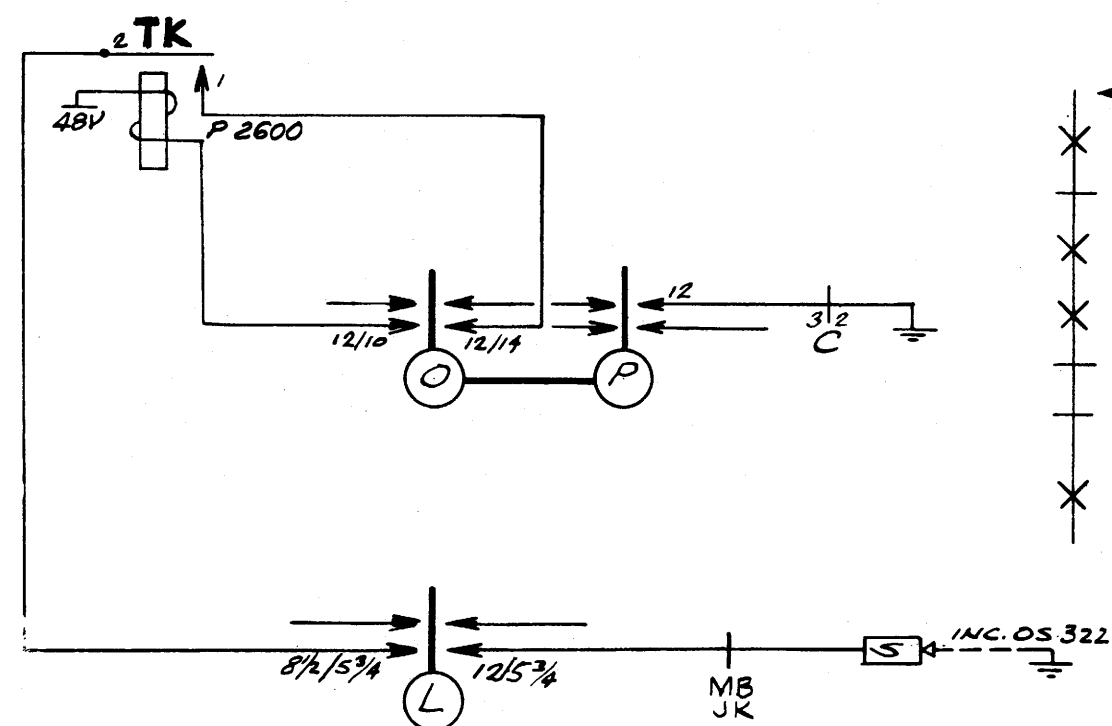
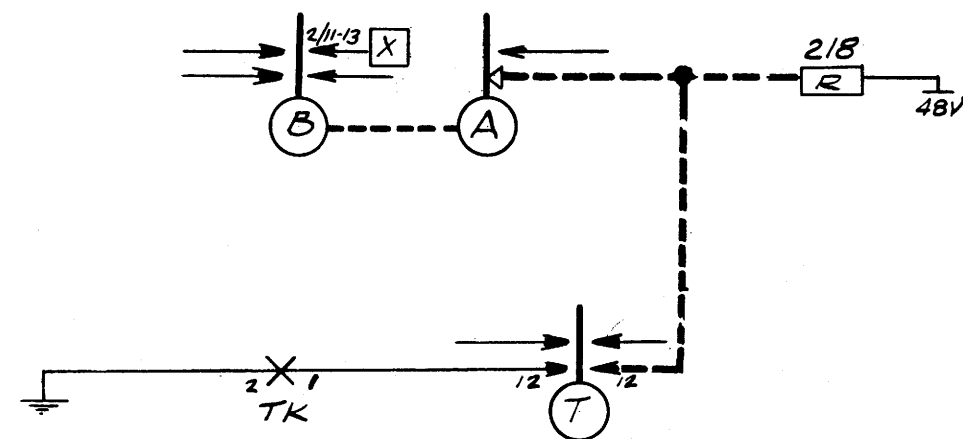
S. D. 20294-011 LINE, START, TRIP & LINK CCT.
S. D. 21115-011 INC. CCT.
S. D. 21077-011 LINE, FIND. & DIST. CCT.

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

INCOMING OVERFLOW AND 45
LINE FINDER OVERFLOW

PANEL SYSTEM
BATTERY CUT-OFF

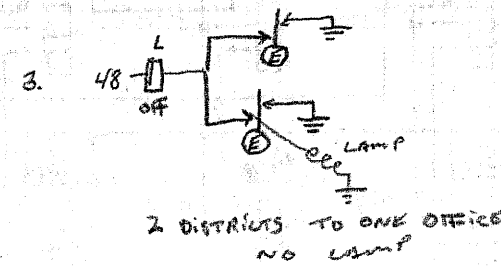
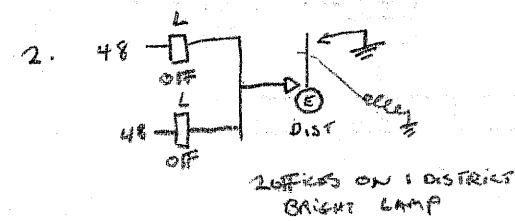
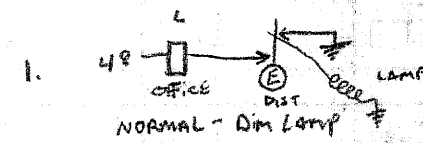
05-350



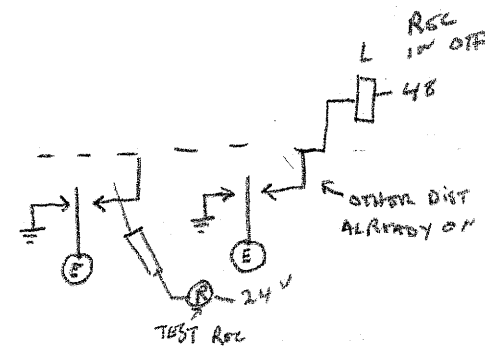
IF NO BRUSH TRIPPED IN FINAL
(5) CANNOT OPR. CALL GOES TO
TT WHERE BUSY IS SENT BACK

S.D. 21200-01 FINAL C.T.
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
FINAL TELL TALE 46
PANEL SYSTEM
BATTERY CUT-OFF OS-351

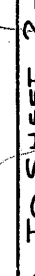
ATTACH ONE SIDE OF DOUBLE CONNECTION LAMP TO DIST (E) CAM } (DEPENDING ON DIST)
 GRD OTHER SIDE OF LAMP
 LIFT (E) 3 SPRING AWAY FROM THE CAM



IND 4 (B) CAM
 PRY 3 (E) CAM



WHEN TESTING GO TO 24V W/TEST REC TO SPRING ATTACHED TO SLV - W/ PROBE LIFT SPRING
 CLICK ON CAM = NO DEL
 NO CLICK ON CAM = DEL



OVER FLOW
Tall Tale

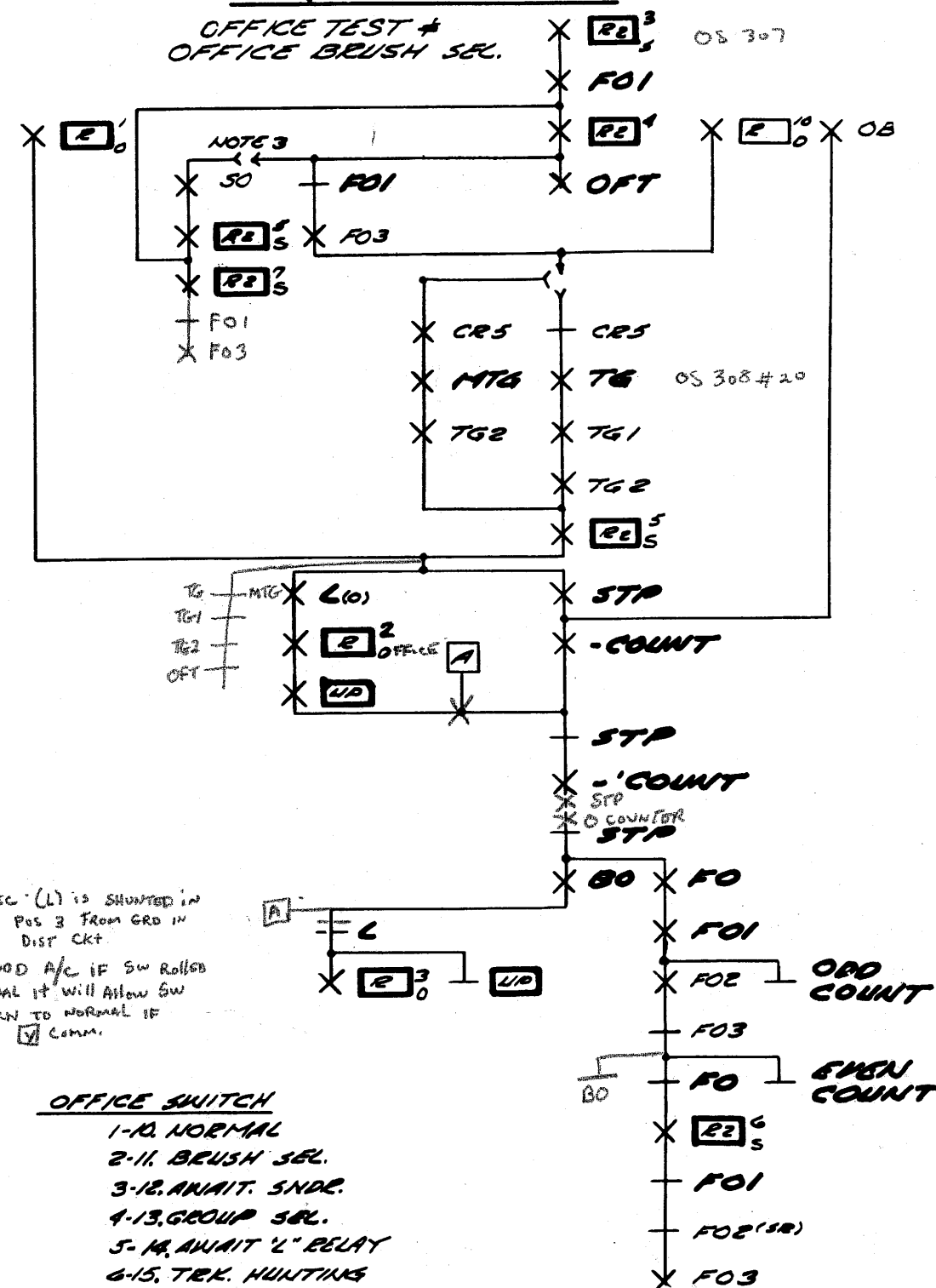


STRAPPING
FOR
OFFICE COMM. BR.

SEC. (L) IS SHUNTED IN
POS 3 FROM GRD IN
DIST CKT.

WDR GOOD A/C IF SW ROLLS
OFF NORMAL IT WILL ALLOW SW
TO RETURN TO NORMAL IF
NOT ON ☒ COMM.

OFFICE TEST #
OFFICE BRUSH SEL.

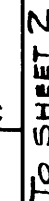


1-10. NORMAL
2-11. BRUSH SEL.
3-12. AWAIT. SNDR.
4-13. GROUP SEL.
5-14. AWAIT "L" RELAY
6-15. TRK. HUNTING
7-16. AWAIT. "L" RELAY
8-17. TALKING
9-18. OVERFLOW & RETURN

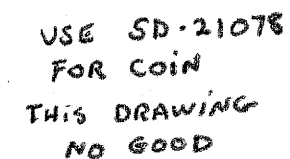
3. DIST. GROUP
4. OFFICE TEST
5. OFFICE BRUSH
6. OFFICE GROUP
7. TRUNK TEST

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
OFFICE SELECTIONS AND
OFFICE TEST 21

PANEL SYSTEM BATTERY CUT-OFF	OS-352
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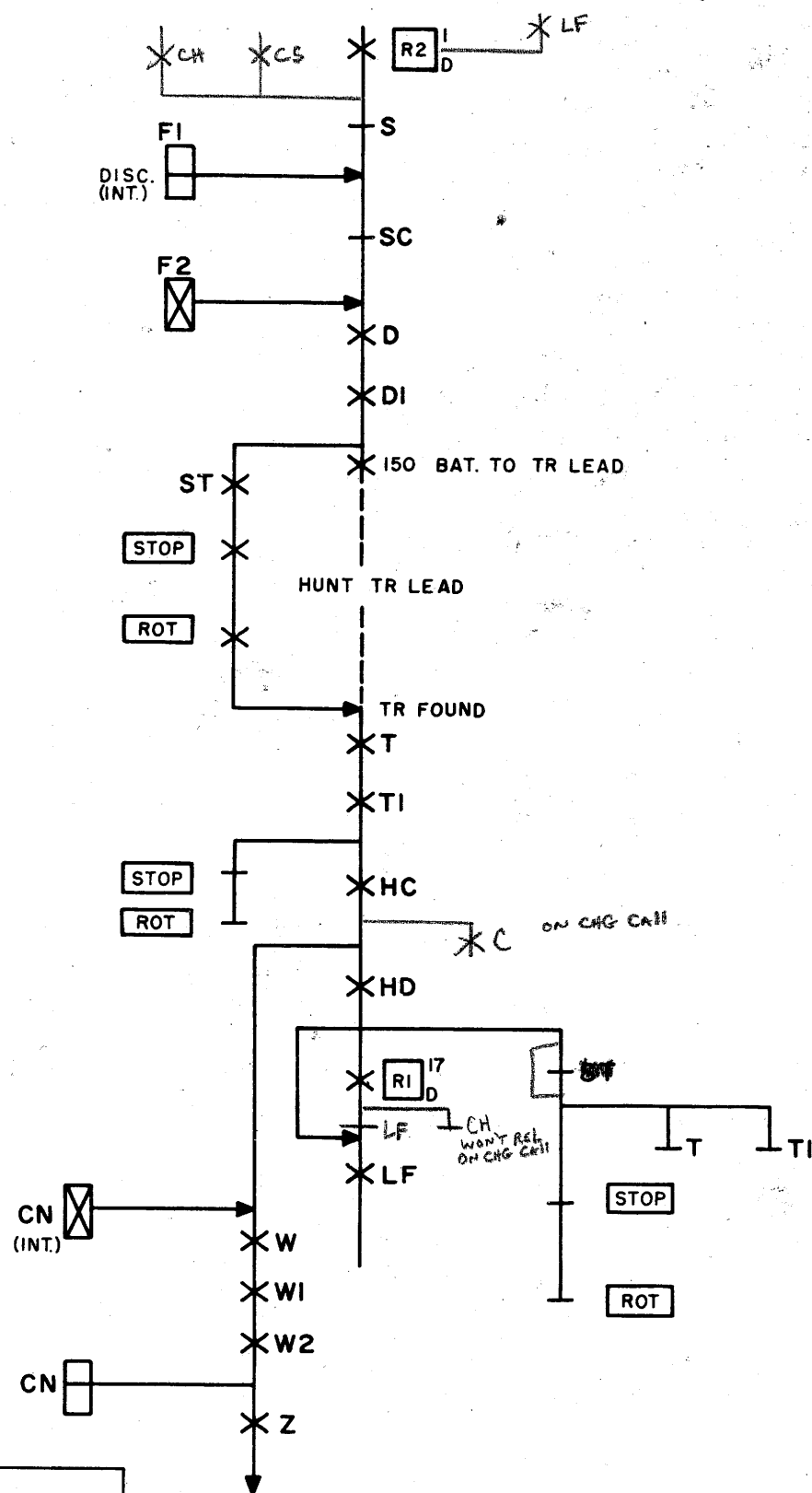


PANEL SYSTEM BATTERY-CUT-OFF	OS-353
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SHEET 2 OF 2

USE



110V- BAT THRU NORMAL C TO T&R
NO CHARGE COIN RETURN

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
COIN DISTRICT
RETURN TO NORMAL

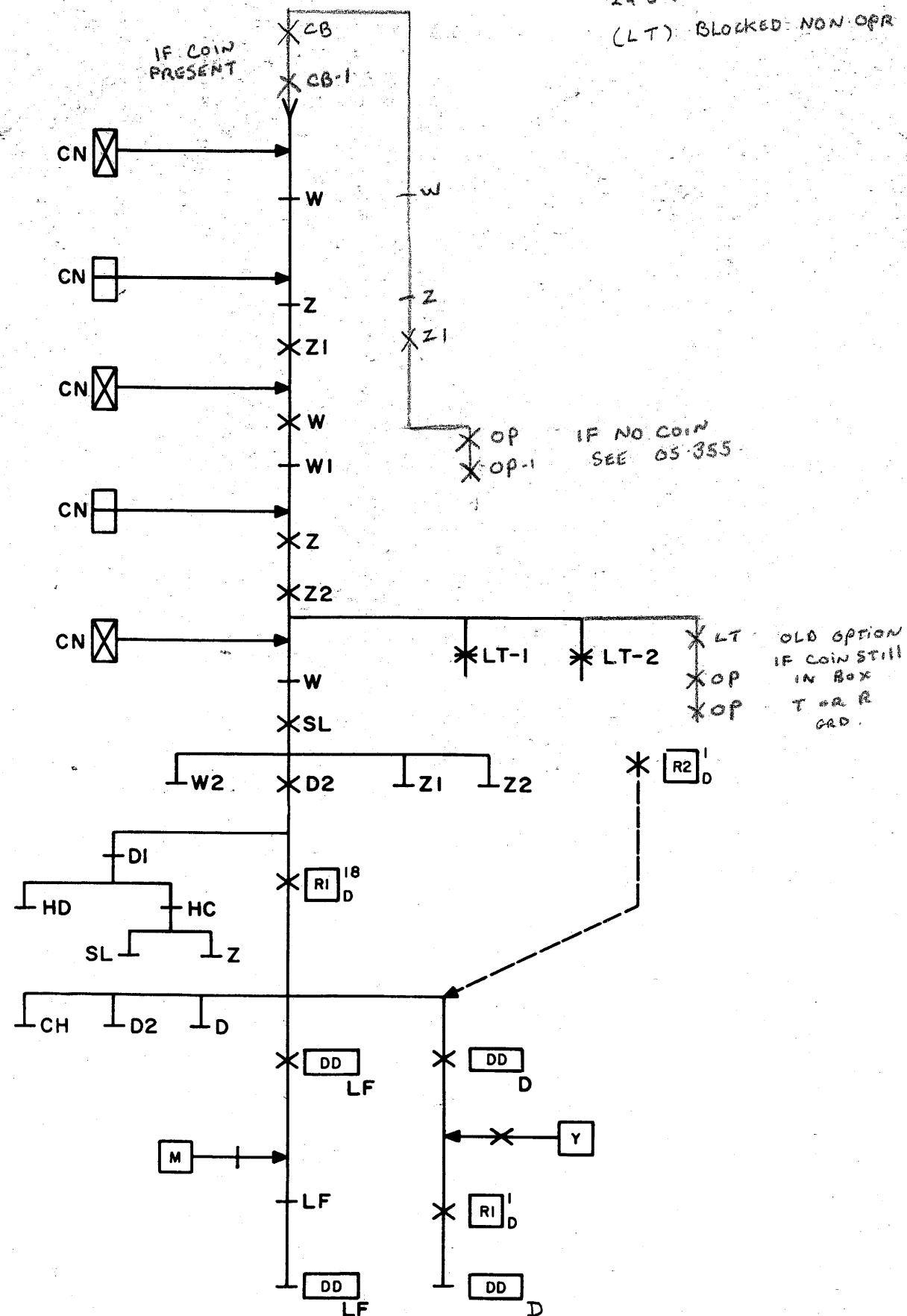
PANEL SYSTEM
BATTERY-CUT-OFF

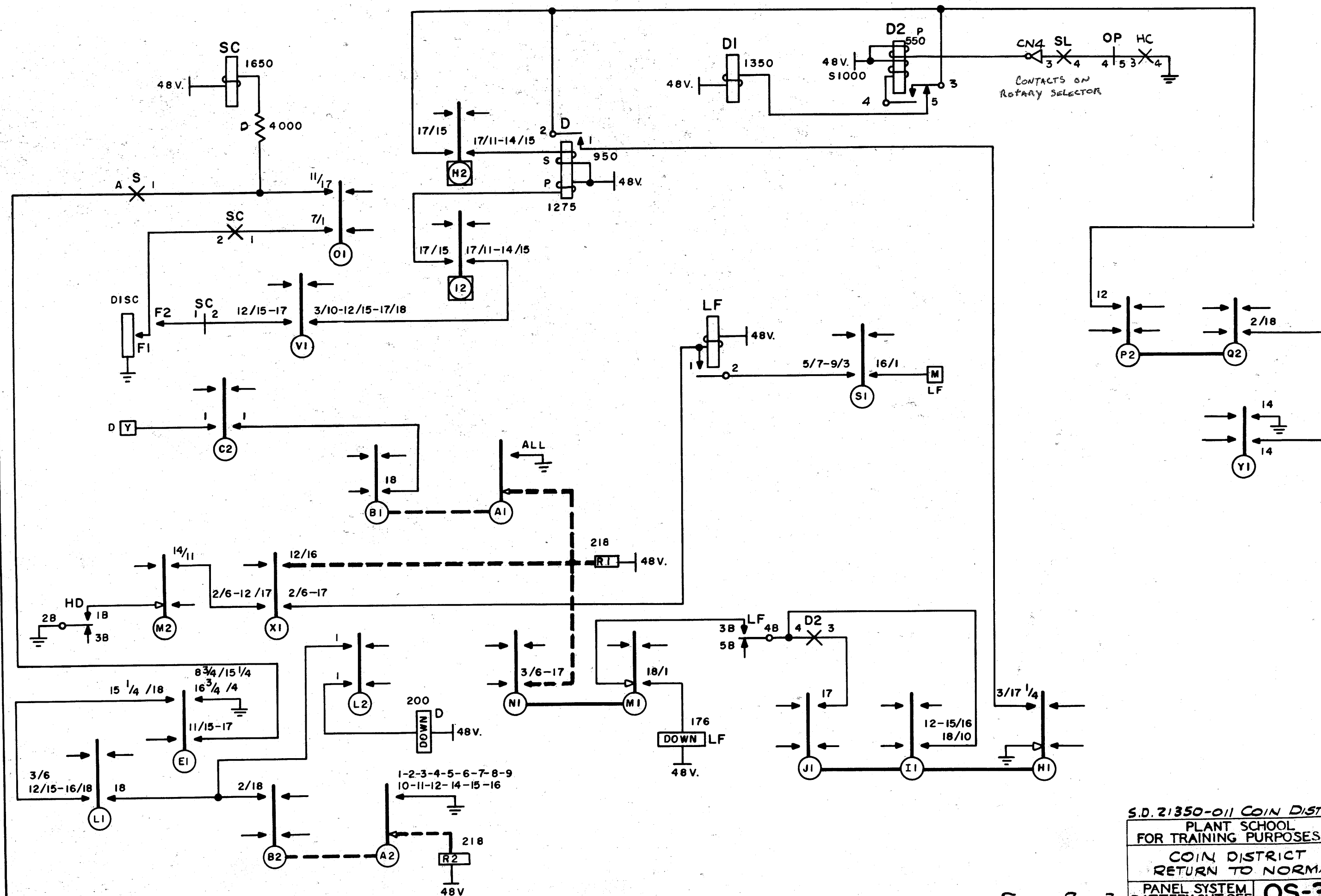
OS-354

SHEET 1 OF 2

CB-1

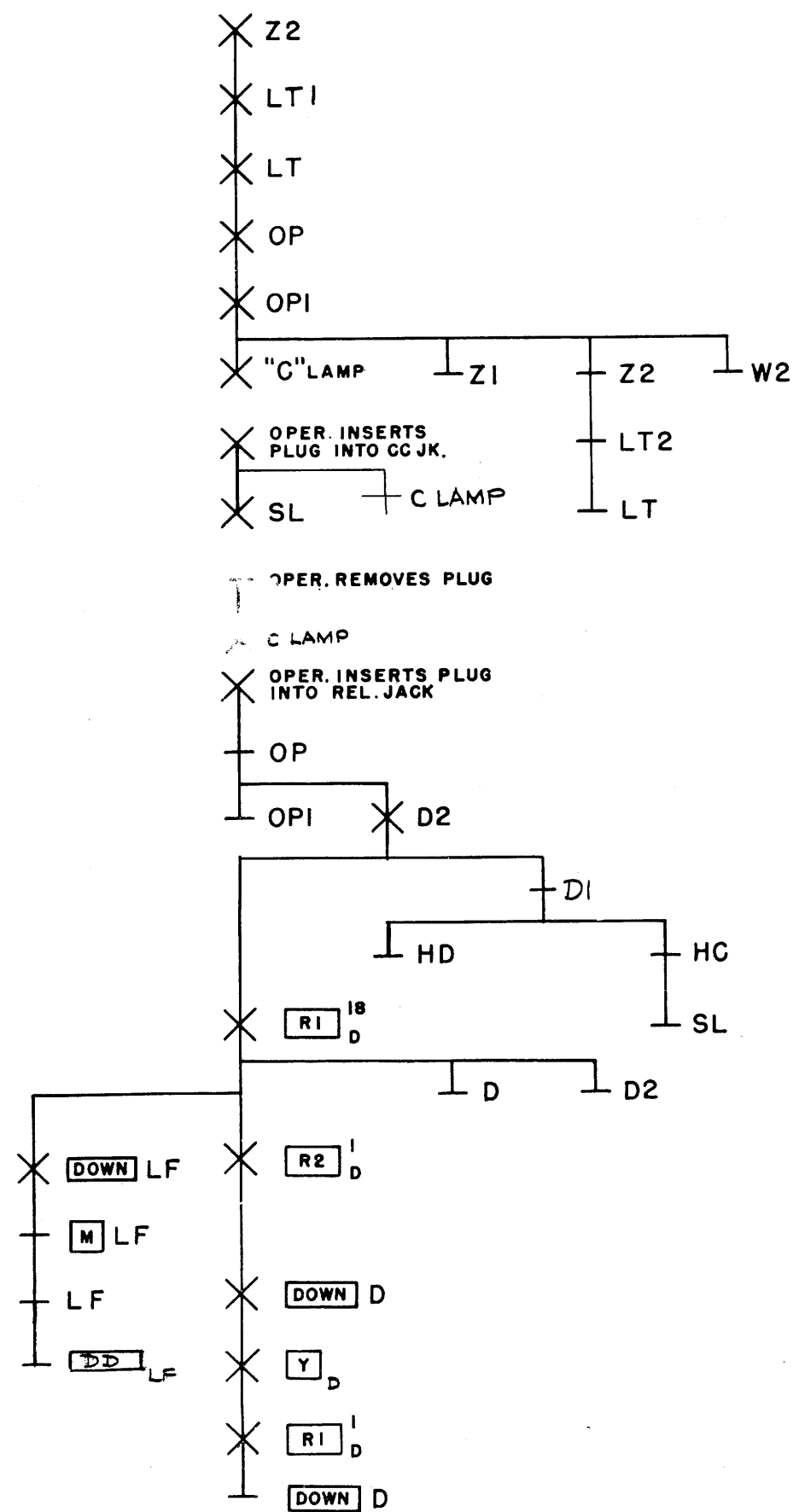
2 & 3 B ARE OPENED
(LT) BLOCKED: NON-OPR





S.D. 21350-011 COIN DISTRICT
PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
COIN DISTRICT 40
RETURN TO NORMAL
PANEL SYSTEM
BATTERY CUT-OFF OS-354

**FAILURE TO
COLLECT OR REFUND
ON DISCONNECT**





S.O. 21350-01 COIN DISTRICT

PLANT SCHOOL FOR TRAINING PURPOSES ONLY	
LINE TEST 41	
TALKING TO OPERATOR	
PANEL SYSTEM BATTERY CUT-OFF	OS-355

SD-96479-01 AUX SDR
SD-96483-01 AUX SDR LINK

HEAVY NEGATIVE & LIGHT POSITIVE

48 B

REG. RELAY CIRCUIT

NOTES

- #2 & #3 Springs make 1/4 before & after Pos. indicated. 3P
- #3 Spring makes 1/2 before & after Pos. indicated. 3F
- #2 Spring makes 1/2 after Pos. indicated. 2S
- FP & FPI releases when R3 leaves Pos. 10 on 2nd rev.
- SP operates from C1 relay.
- LR & LRI operates abandoned calls.
- + & - sent over tip, - & = sent over ring.
- ① Furnishes - 2nd period ② Furnishes - 2nd & 4th period.
③ Furnishes - 4th period ④ Furnishes + 1st period ⑤ Furnishes + 3rd period
- + Pulses are never sent in both 1st & 3rd periods.
- Pulses are sent in both 2nd & 4th period regardless of reg. relays.
= is superimposed in 2nd & 4th period by Reg. relays.

IF NO DIGITS DIALED
INTO STATIONS A
0 IS SENT

PULSE CHART

Pulse Code Chart for 3 digit senders

Sta.	Thou	Other	1st	2nd	3rd	4th
0	0	0	-	-	-	-
1	2	1	+	-	-	-
W	4	2	-	-	-	-
R	6	3	+	-	-	-
J	8	4	-	-	+	-
M	1	5	-	-	-	-
	3	6	+	-	-	-
	5	7	-	-	-	-
	7	8	+	-	-	-
	9	9	-	+	-	-
1st CYCLE STA	10 1/4	17 1/2	10 1/4	17 1/2	10 1/4	17 1/2
2nd " TH	20 1/4	11 1/2	23 1/4	3 1/2	11 1/2	3 1/2
3rd " A H	4 1/4	5 1/2	6 1/4	7 1/2	8 1/4	9 1/2
4th " B T	8 1/4	9 1/2	10 1/4	11 1/2	12 1/4	13 1/2
5th " C U	12 1/4	13 1/2	14 1/4	15 1/2	16 1/4	17 1/2
Final Heavy pulse	17 3/4	18 1/4	(2nd Rev.)			

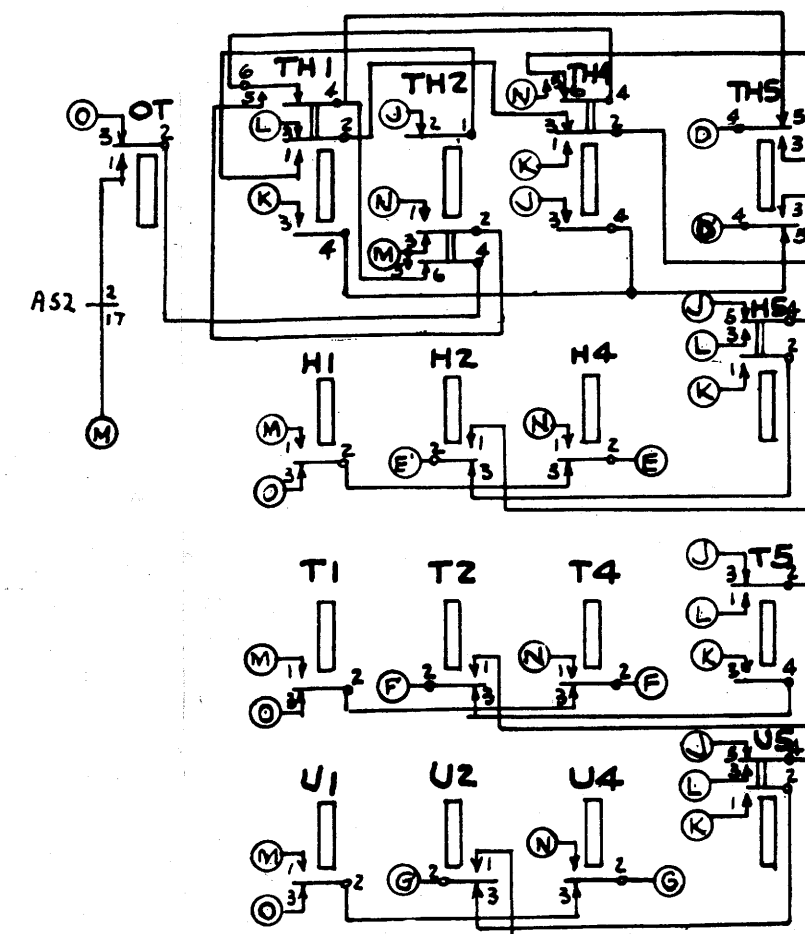
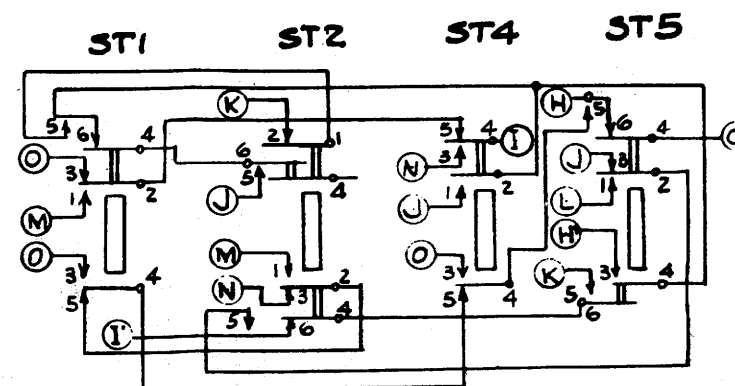
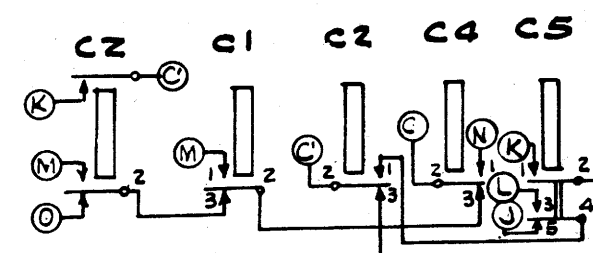
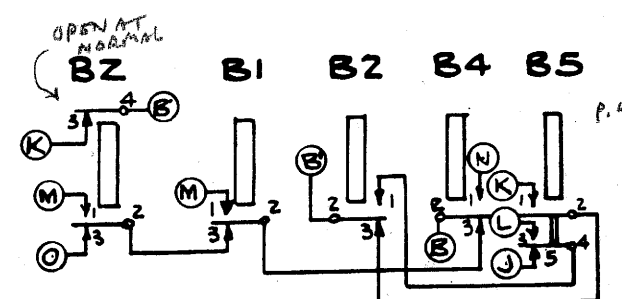
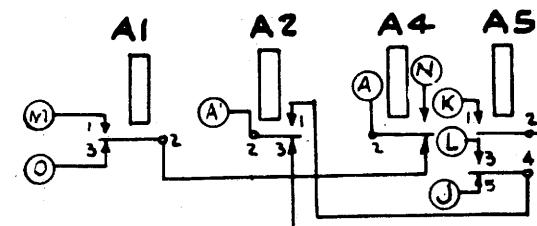
(FP) REL 1st 2nd REV
(TAN) ROTATES 17 1st REV

R₃ SW Rotations

(OT) ⁰	(OT) ¹	(OT) ²
7 DG AUX SDR	10 DG AUX SDR	TAN PCI
1st 2nd	1st 2nd	1st 2nd
TH	A	STA
H	B	TH
A	T	X
B	U	O
C	STA	X
	H	C
	U	FD

TENS & DIALS
INTO
AUX SDR

10 DG C11	X	O	X	A	B	C	TH	H	TU
REGISTER	A	B	C	TH	H	T	U	STA	AUX



R₃ Switch

Pos 17 PCI DIR STA-TH-H-T-U-FP
5 TAN PCI A-B-C-STA-TH-H-T-U-FP
5 7 DG AUX A-B-C-TH-H-T-U-STA
5 10 DG AUX X-O-X-A-B-C-TH-H (T+U AUX SDR)

(AS)⁰ (AS-1)⁰ (AS-2)⁰ (OT)⁰ = SEND DIGITS IN ORDER DIALED

CD-21193-01 APR 103.17

PAR. 68-73

S.D. 21193-011-012-013 SENDER

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY

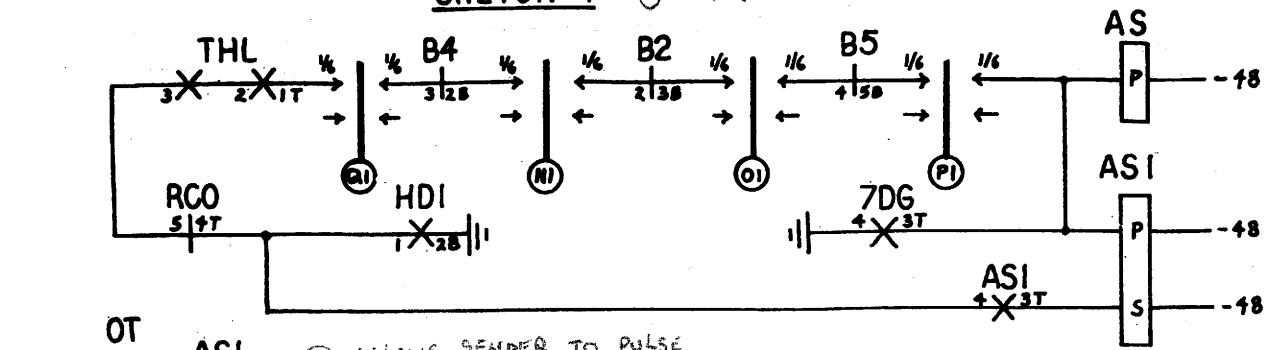
PCI IMPULSE

48 B

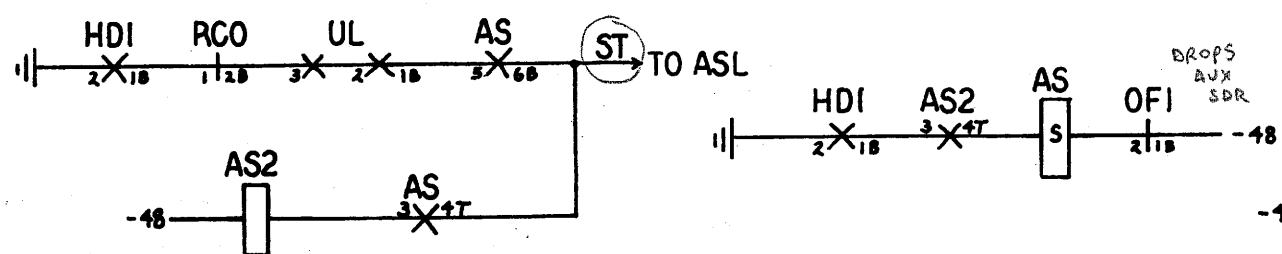
PANEL SYSTEM
BATTERY CUT-OFF OS-32

SHEET 2 OF 4

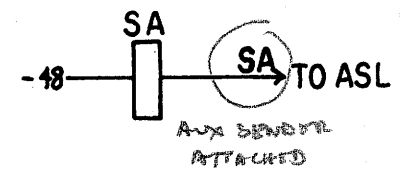
SKETCH 1 0 or 1 in B digit



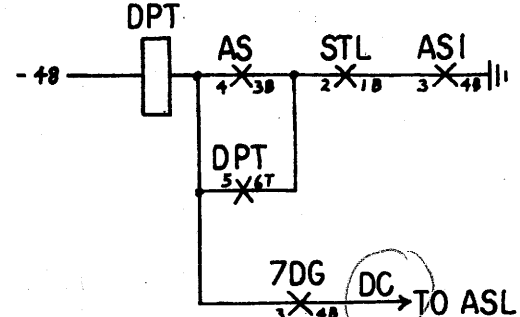
SKETCH 2



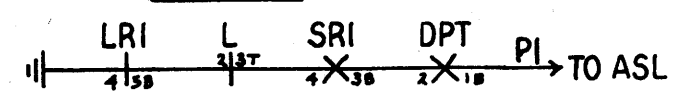
SKETCH 3



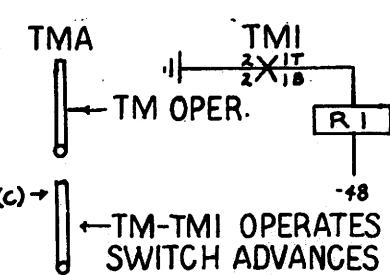
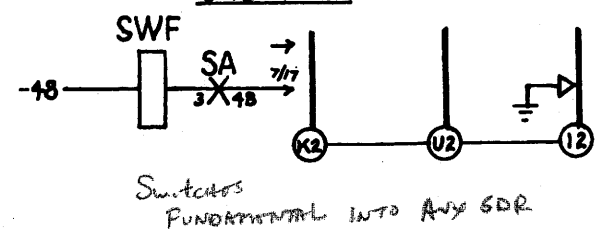
SKETCH 4



SKETCH 5

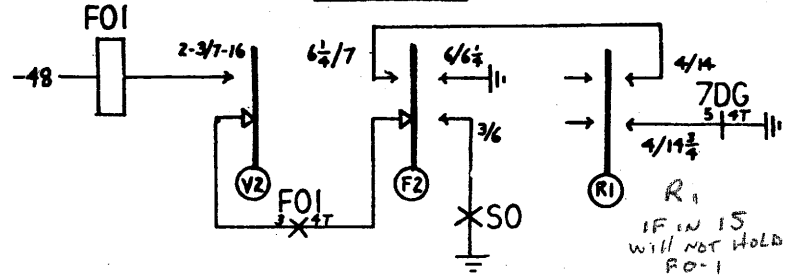


SKETCH 6

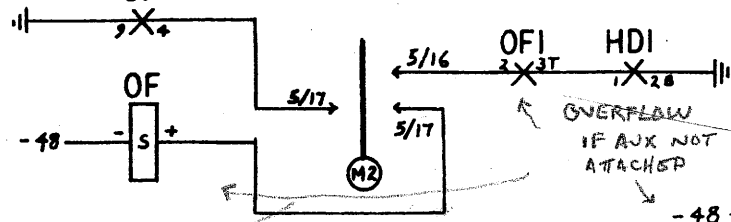


RI SWITCH ADVANCE
TM-TMI RELEASE

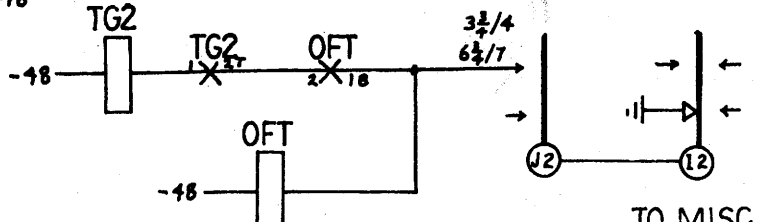
SKETCH 8



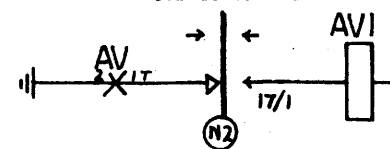
SKETCH 9



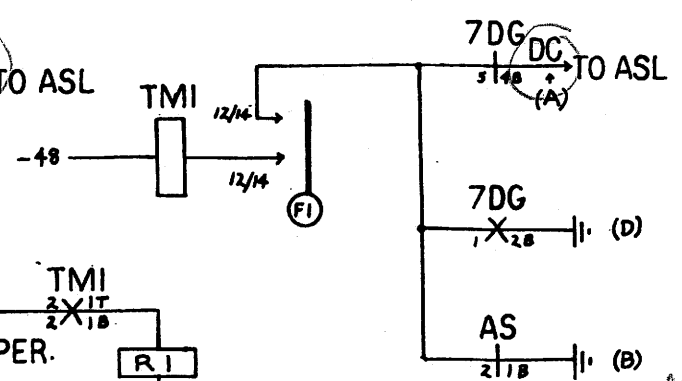
SKETCH 10



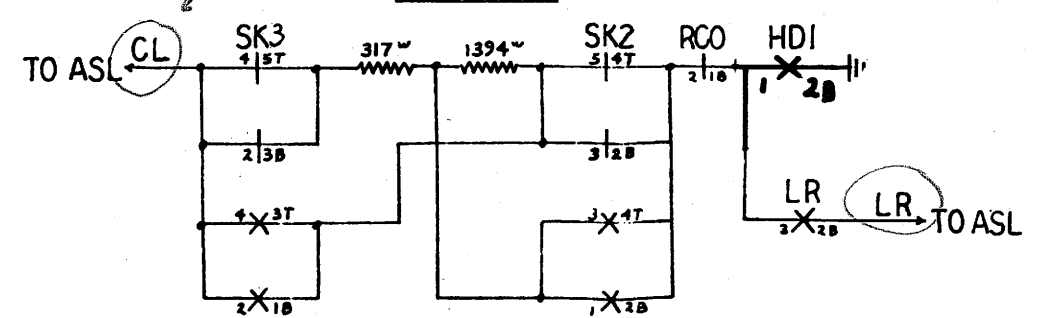
SKETCH 11



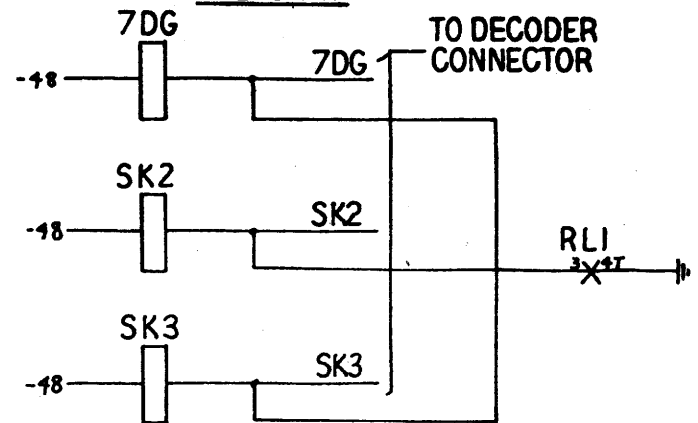
SKETCH 7



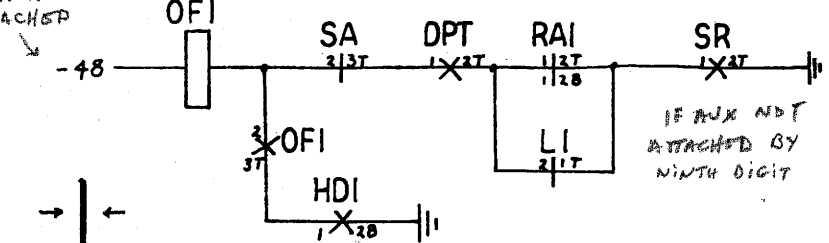
SKETCH 12



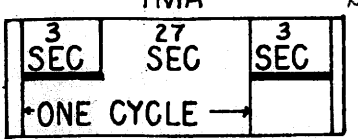
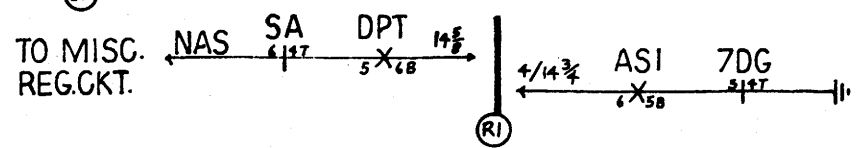
SKETCH 13



SKETCH 14

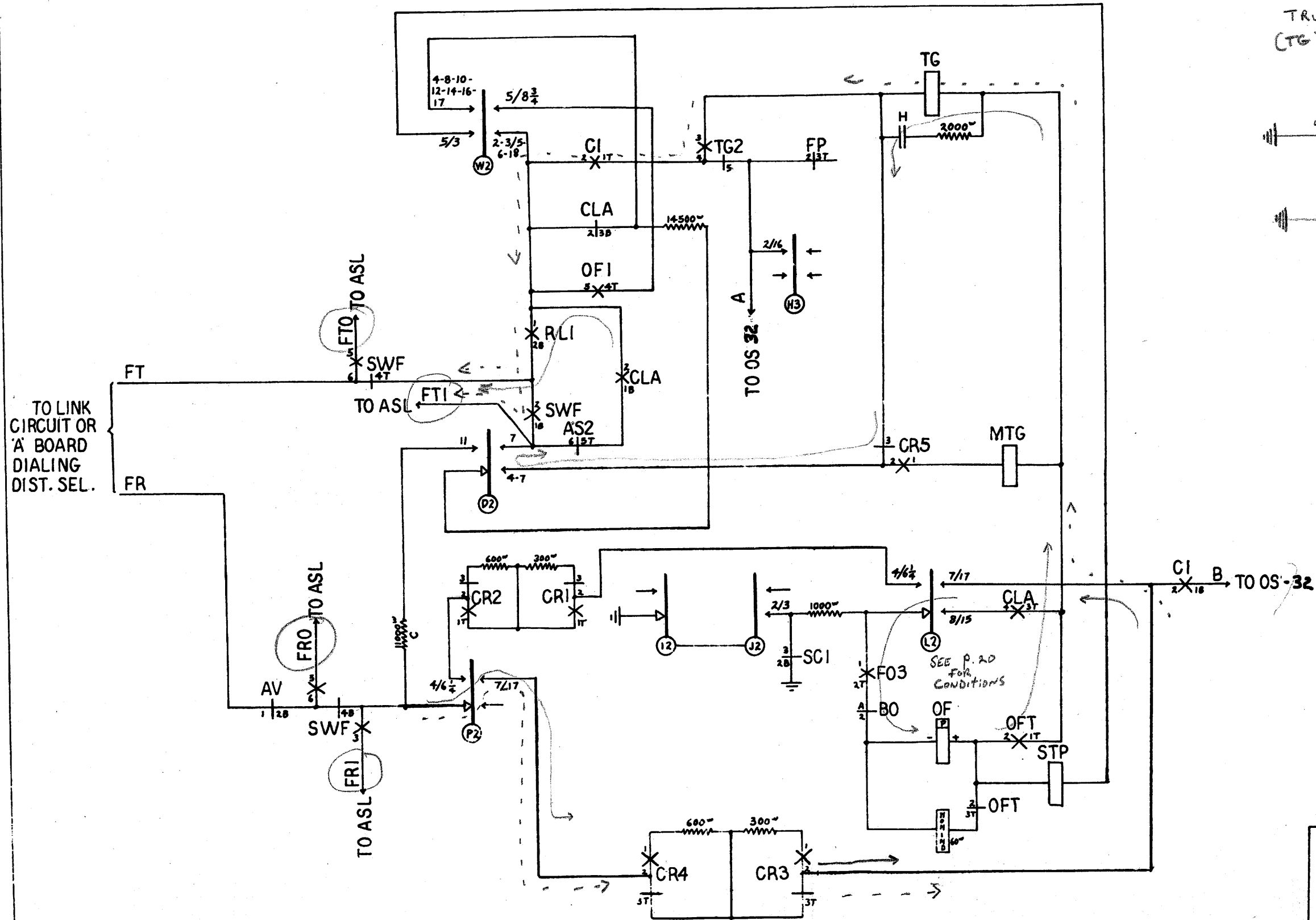


SKETCH 15

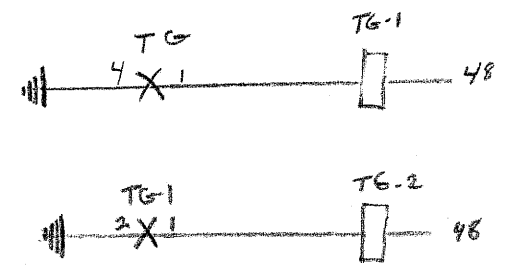


CD-21193
Rev. 3.31
FOR OVERFLOW

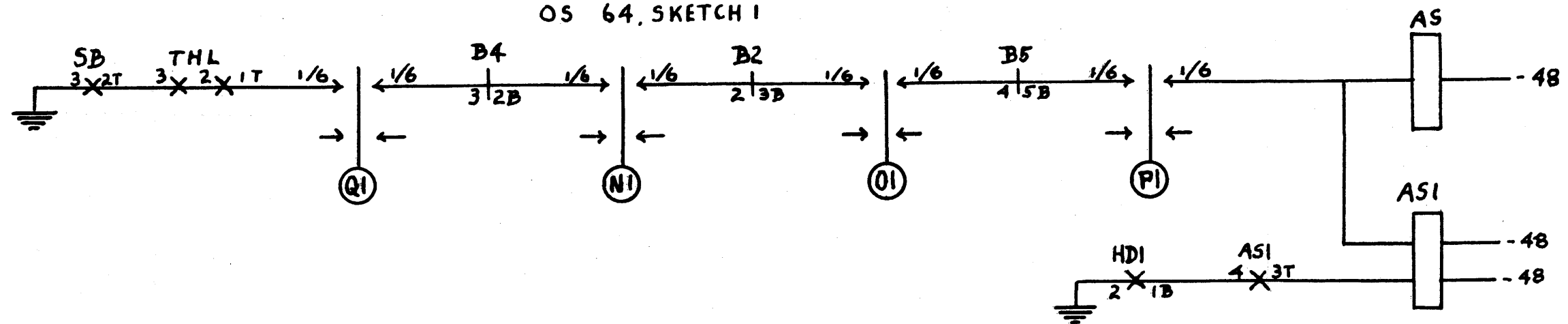
SKETCH 16



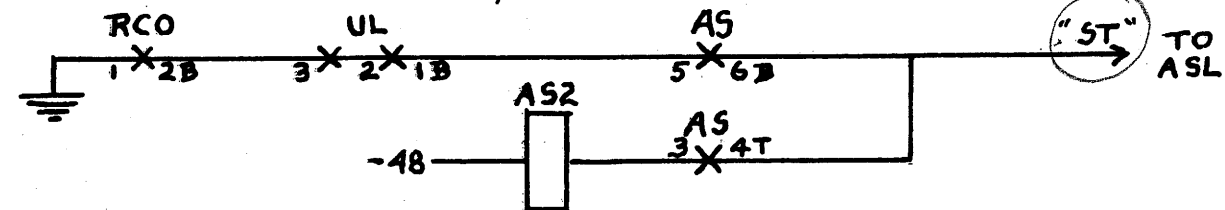
TRUNK TEST PATH →
(TG) HOLDING PATH - - - →



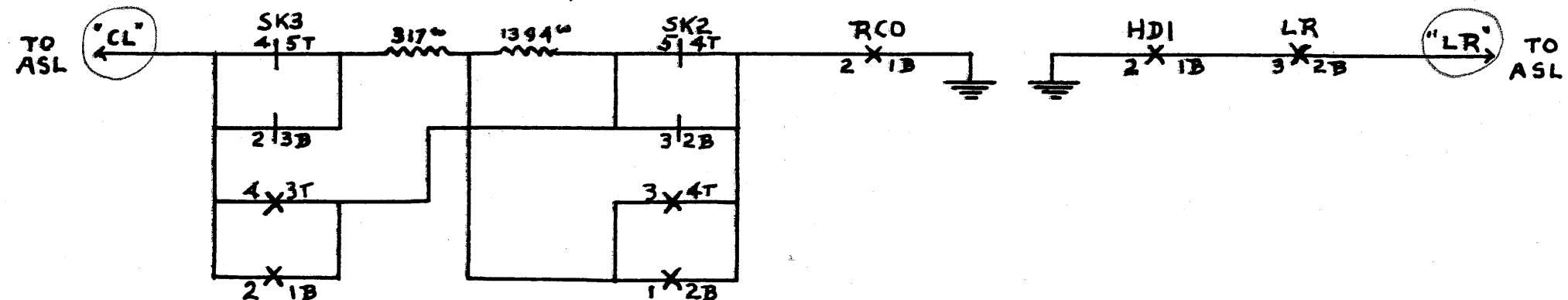
OS 64, SKETCH 1



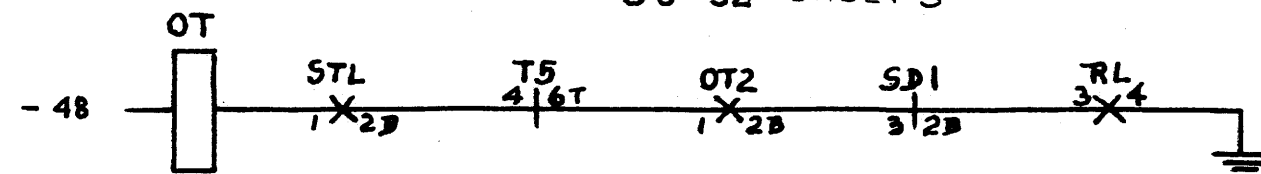
OS 64, SKETCH 2



OS 64, SKETCH 12

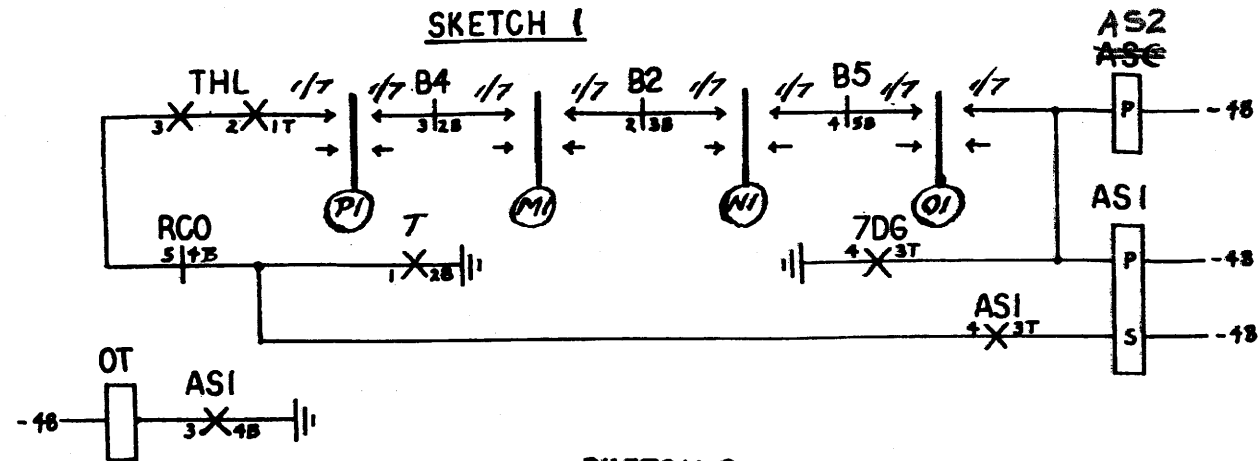


OS 32 SHEET 3

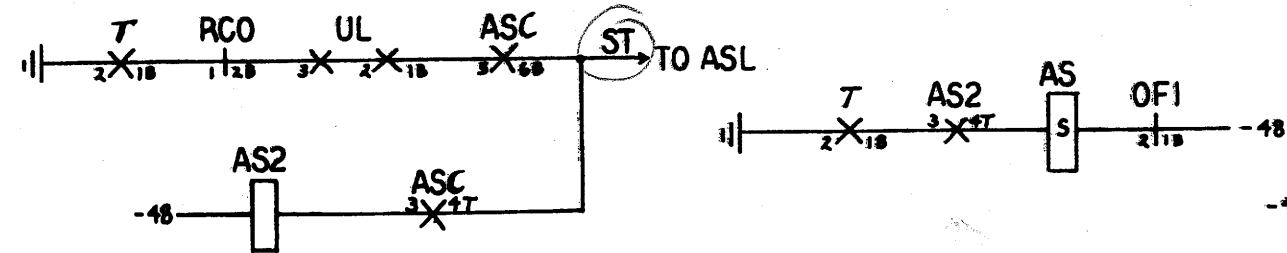


○ = LEADS TO AUX SDR LINK

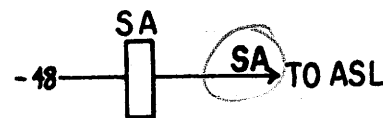
SKETCH 1



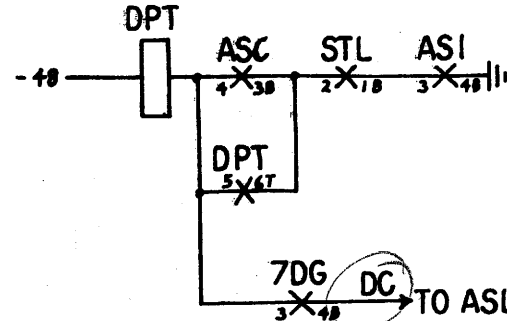
SKETCH 2



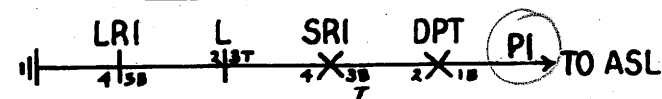
SKETCH 3



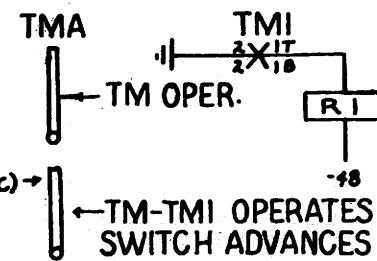
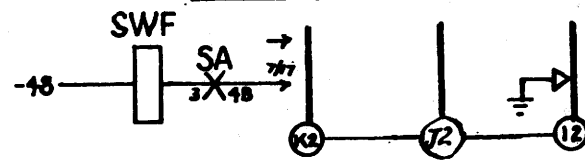
SKETCH 4



SKETCH 5

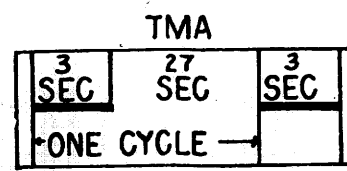
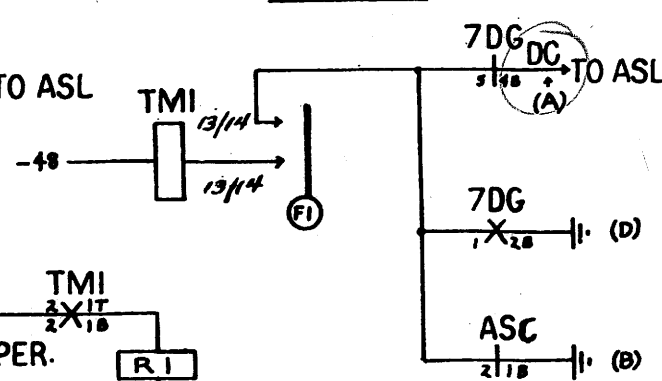


SKETCH 6

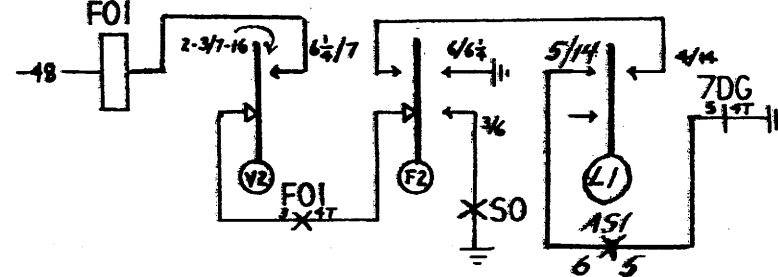


RI SWITCH ADVANCE
TM-TMI RELEASE

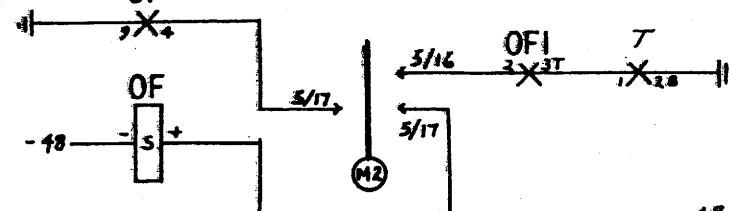
SKETCH 7



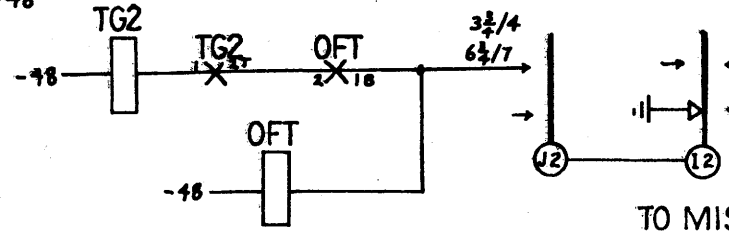
SKETCH 8



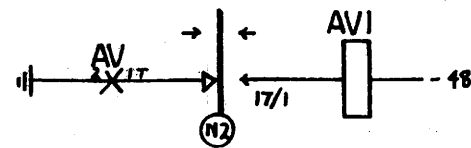
SKETCH 9



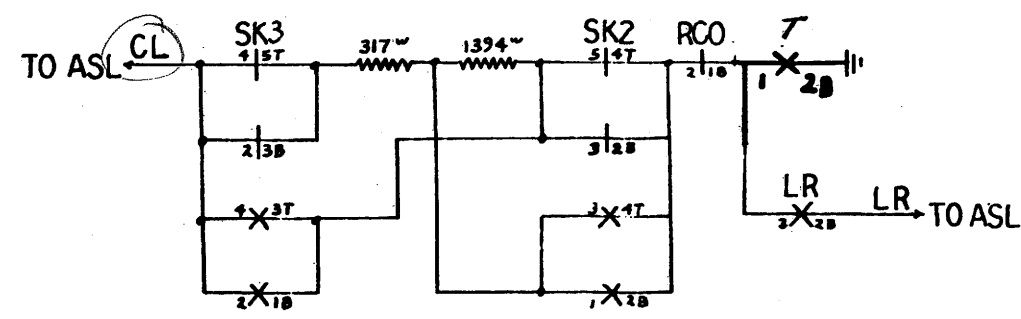
SKETCH 10



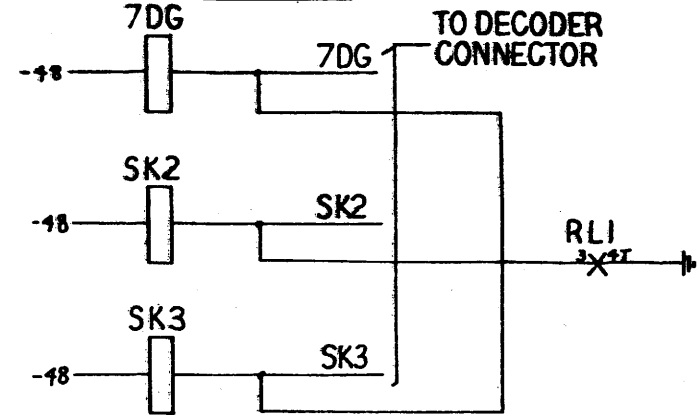
SKETCH 11



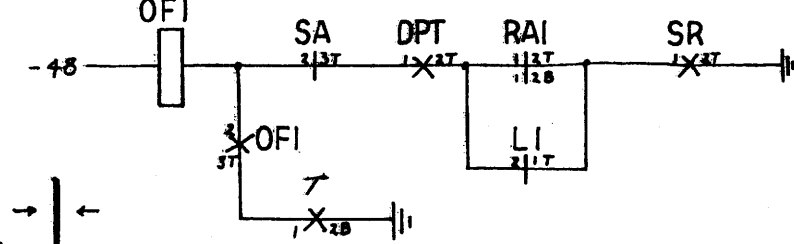
SKETCH 12



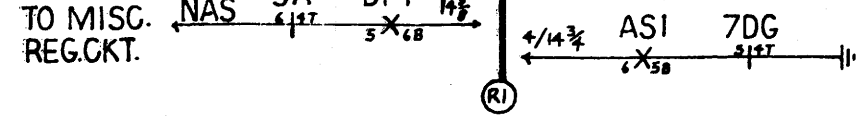
SKETCH 13



SKETCH 14

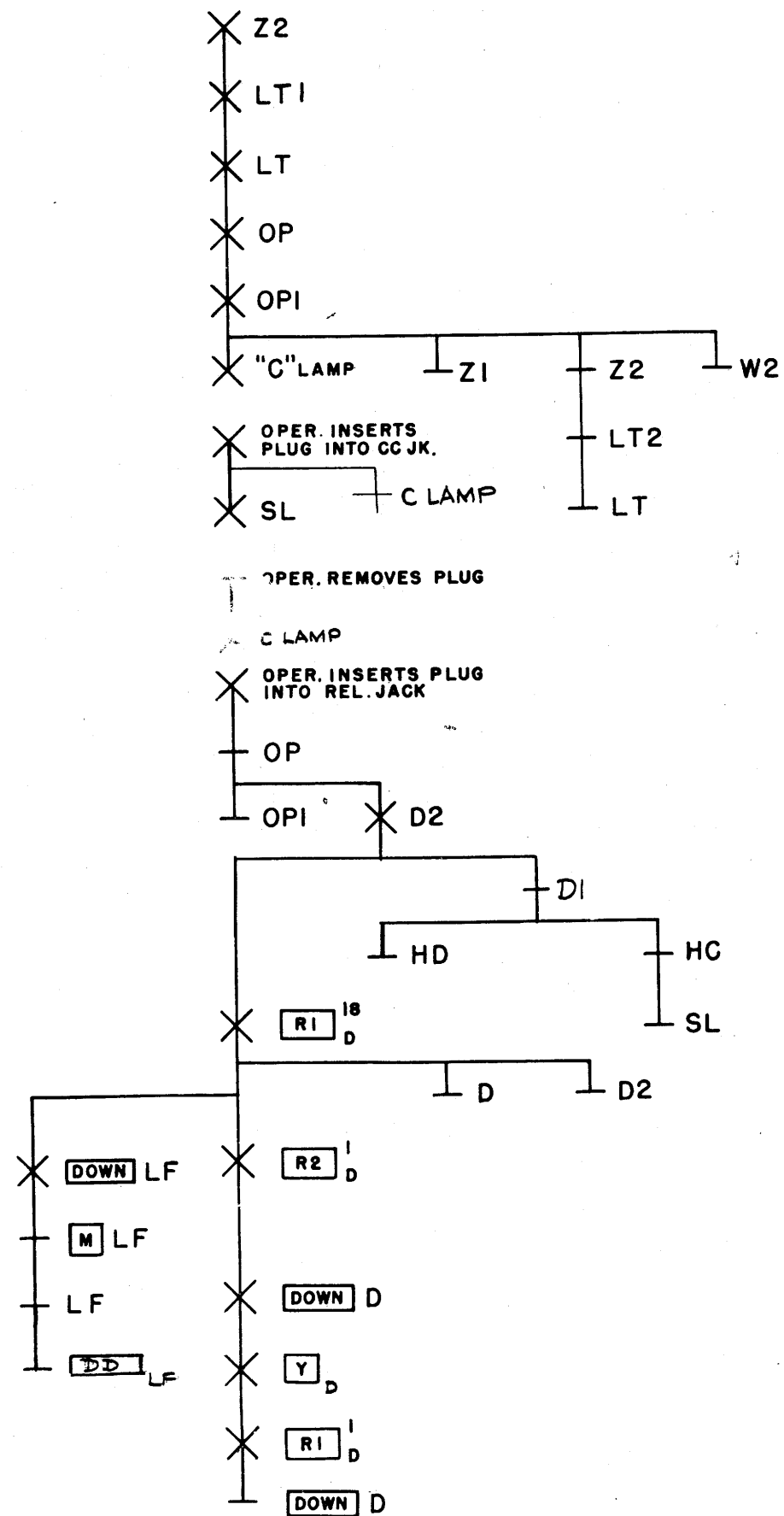


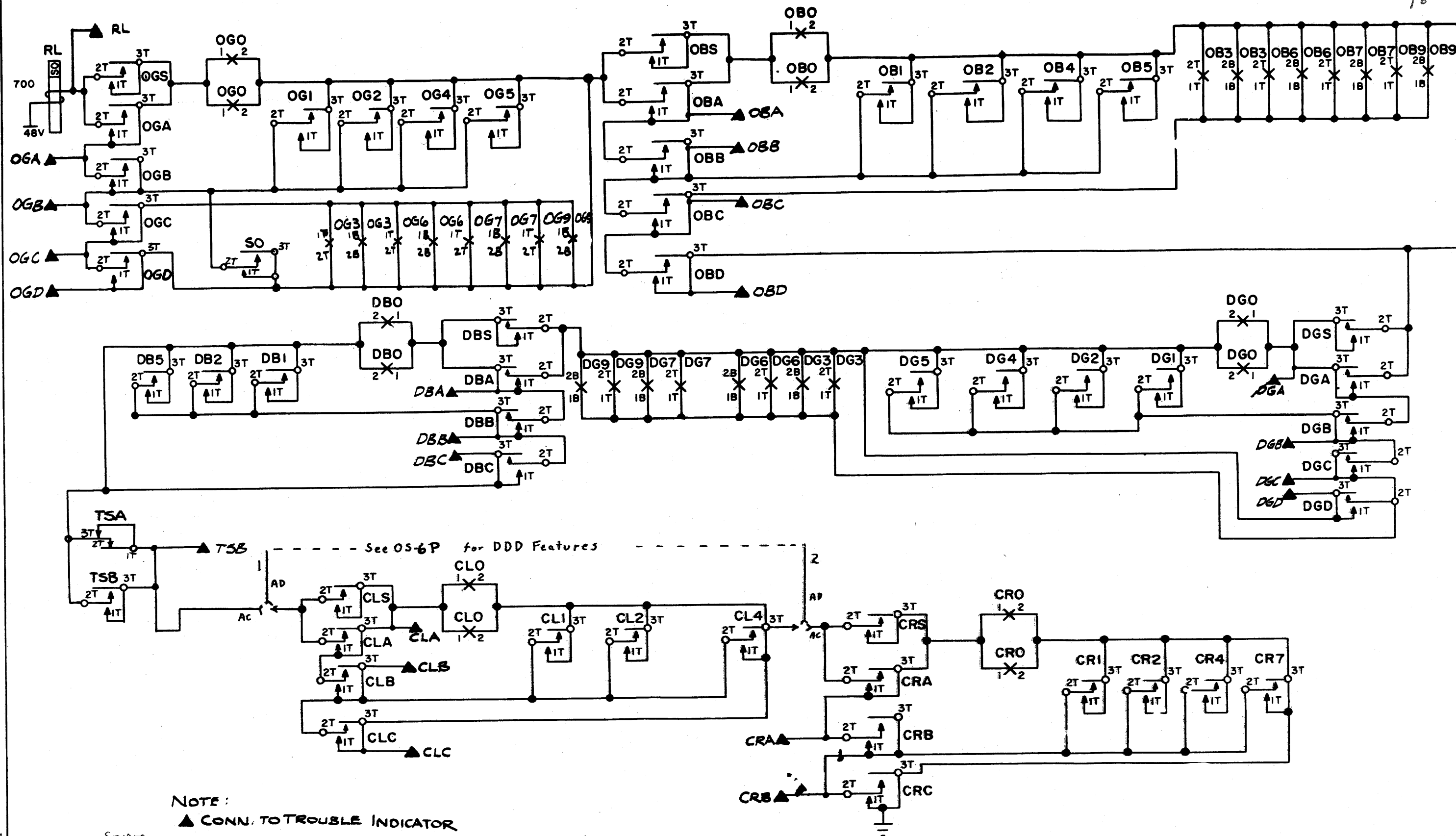
SKETCH 15 NOT SHOWN ON SD 21193-029



○ = LOADS TO AUX SDR LINE

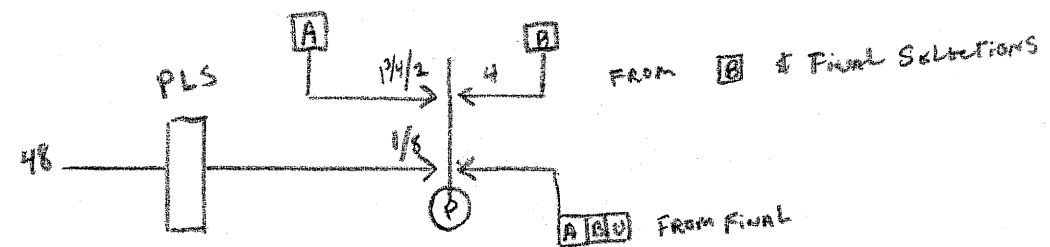
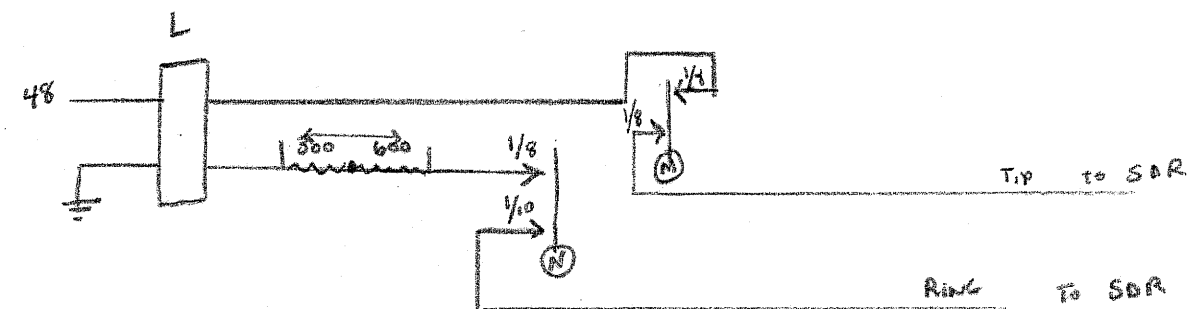
FAILURE TO
COLLECT OR REFUND
ON DISCONNECT

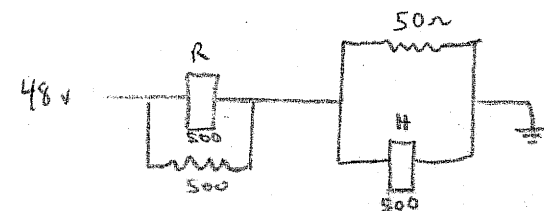
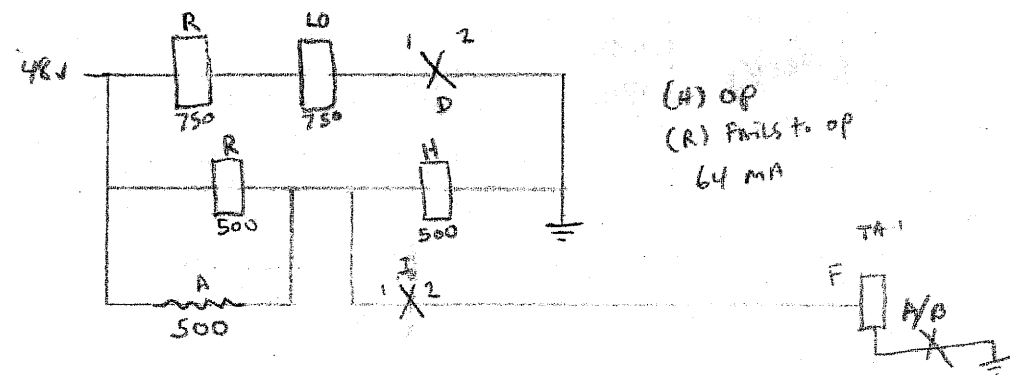
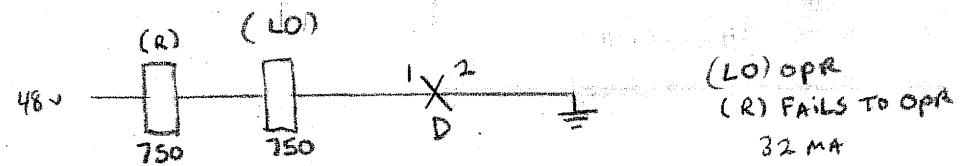




S.D.21277-011/019 DECODER CCT.
 PLANT SCHOOL
 FOR TRAINING PURPOSES ONLY
 DECODER
 CHECK OF TRANSMITTING LEADS
 AND RELEASE
 PANEL SYSTEM
 BATTERY CUT-OFF
 OS-6L¹⁸

BALANCED CIRCUIT
 OPTION J
 LONG LOOP
 POSITIVE SHUNTING OF (STP)
 ALL INC & FINAL SELECTIONS



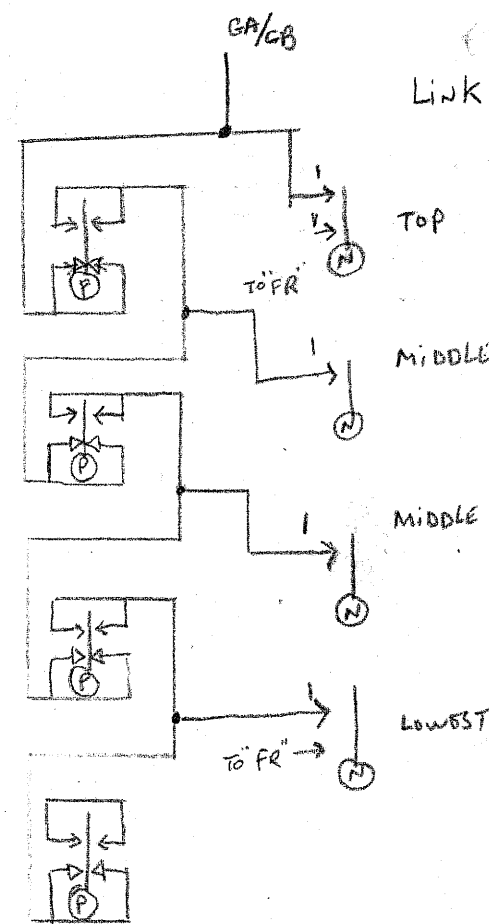


AFTER (H) OPR'S
(R) WILL OPR
ABOUT 144 MA

"GA" LOOPS THRU
ANY SWITCHES UNTIL
ONE IS FOUND IN POS 1

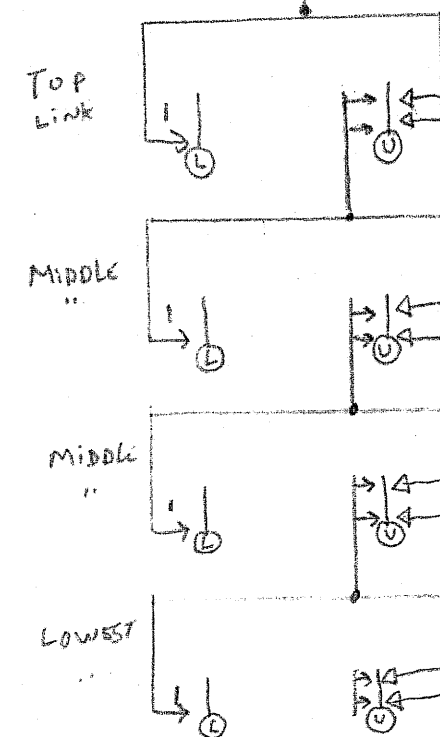
1 & 4 OF (P)
MADE ALWAYS

2 & 3 OF (P)
MADE 2/9
11/18



GA/GB LEAD SIMILAR
EXCEPT P & N CAMS USED
SEE

STA/STB
STA LEAD LOOPS
THRU ANY SS NOT
IN POS 1 TIL A
LINK SW IN POS 1
IS FOUND.



3 & 4 (U) MADE
ALWAYS

1 & 2 (U) NOT MADE
POS 1

APPENDIX A

BASIC CIRCUITS

1. A CONTACT SPRING IS DESIGNATED THE SAME, WHETHER THE APPARATUS IS VIEW FROM THE CONTACT SIDE, OR THE TERMINAL SIDE
2. THE UPPER AND LOWER RELAY CONTACTS AND WINDING TERMINALS OF ALL RELAYS ARE DESIGNATED "T" (TOP) AND "B" (BOTTOM) EXCEPT AS NOTED

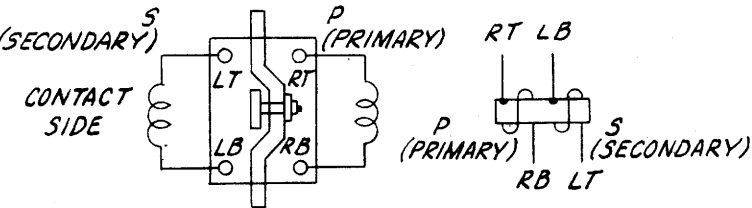
(A) ALL ARMATURE TERMINALS THAT ARE NOT IN ALIGNMENT WITH OTHER TERMINALS ARE DESIGNATED "A"

(B) THE LETTERS "L" AND "R" INDICATE THE LEFT AND RIGHT SIDE, FACING THE FRONT OR CONTACT SIDE OF THE RELAY. FACING THE REAR OR TERMINAL SIDE OF THE RELAY AN "L" TERMINAL WILL BE ON THE RIGHT AND AN "R" TERMINAL WILL BE ON THE LEFT.

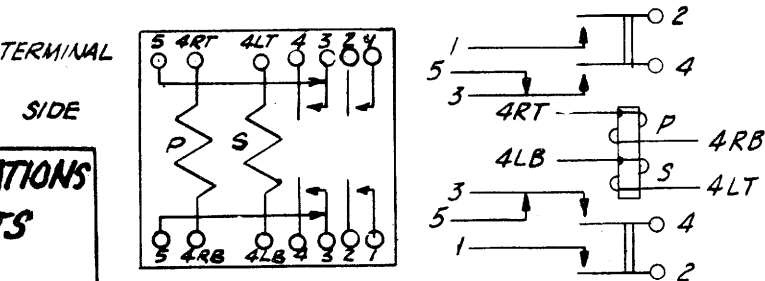
3. E TYPE RELAYS

(A) THE CONTACT SPRINGS ARE NUMBERED LEFT TO RIGHT FACING THE CONTACT SIDE OF THE RELAY AND FROM RIGHT TO LEFT FACING THE TERMINAL SIDE OF THE RELAY.

(B) WHERE A WINDING TERMINAL IS DESIGNATED BY TWO LETTERS AS "RT", "RB", "LT" OR "LB" IT IS AN INDICATION THAT CONNECTION IS TO BE MADE FROM THE FRONT OF THE RELAY AS SHOWN IN THE FIGURE BELOW

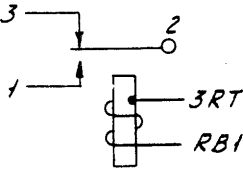


(C) WHERE A WINDING TERMINAL IS DESIGNATED BY A NUMERAL AND TWO LETTERS AS SHOWN IN THE FIGURE BELOW, IT IS AN INDICATION THAT THE CONNECTION IS TO BE MADE FROM THE REAR OR TERMINAL SIDE OF THE RELAY, THE NUMERAL IS THE SAME AS THAT OF THE CONTACT TERMINAL SIDE OF THE RELAY AND INDICATES THE POSITION OF THE WINDING TERMINAL WITH RESPECT TO THE CONTACT TERMINAL



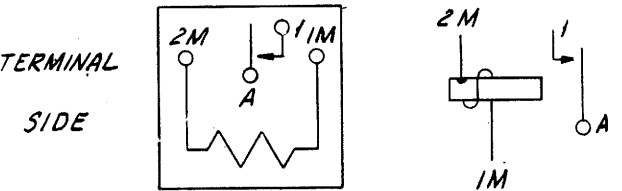
(D) THE FIRST LETTER "R" OR "L" OF THE WINDING TERMINAL DESIGNATION INDICATES ON WHICH SIDE OF THE RELAY CORE FRAME THE WINDING TERMINAL IS ASSEMBLED FACING THE CONTACT SIDE OF THE RELAY. THE LETTER "L" INDICATES LEFT AND "R" RIGHT

(E) WHEN THE NUMERAL FOLLOWS THE LETTERS, IT IS ALWAYS "1" AND INDICATES EITHER THAT THE WINDING TERMINAL IS LOCATED AT THE EXTREME RIGHT END POSITION IN A ROW OF TERMINALS LOOKING AT THE TERMINAL SIDE OF THE RELAY OR THAT IT IS LOCATED IN A ROW OF WINDING TERMINALS ONLY. SEE FIGURE BELOW



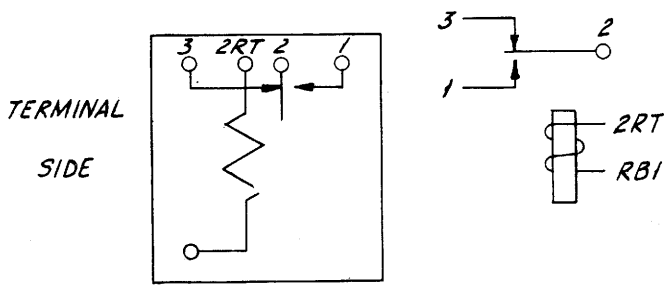
4. B TYPE RELAYS

THESE RELAYS ARE ARRANGED WITH THREE ROWS OF TERMINALS. THE WINDING TERMINALS ARE LOCATED IN THE MIDDLE ROW AND ARE NUMBERED CONSECUTIVELY FROM RIGHT TO LEFT FACING THE TERMINAL SIDE OF THE RELAY WITH A SUFFIX "M" TO INDICATE THE MIDDLE ROW OF TERMINALS. THE CONTACT TERMINALS ARE LOCATED IN THE UPPER ROW AND ARE NUMBERED CONSECUTIVELY FROM RIGHT TO LEFT FACING THE TERMINAL SIDE OF THE RELAY AND ARE NOT GIVEN ANY LETTER DESIGNATION. THE ARMATURE TERMINAL WHICH IS ELECTRICALLY CONNECTED TO THE RELAY FRAME IS DESIGNATED "A". SEE FIGURE BELOW



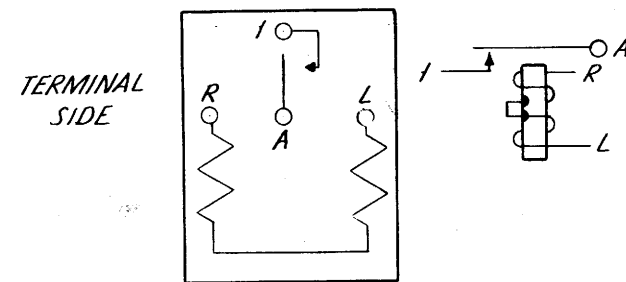
5. L TYPE RELAYS

THE WINDING AND CONTACT TERMINALS ARE NUMBERED FOLLOWING THE SCHEME FOR E TYPE RELAYS. SEE FIGURE BELOW

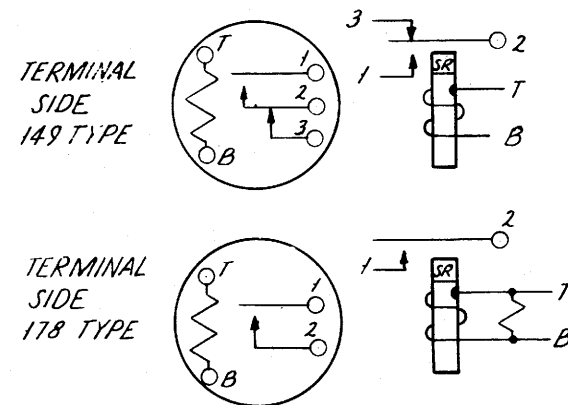


ISSUE	1	2	3	4	5	6	7	8	9	10
DATE	12-31-54	4-6-55								
BY	NAS	LEB								

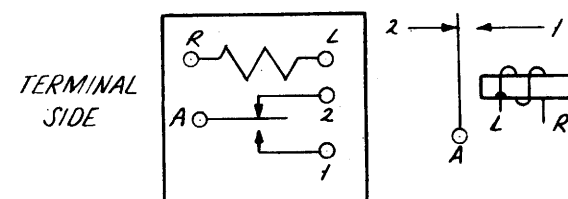
THE ARMATURE (FRAME TERMINAL) IS INDICATED BY "A" AND THE FRONT CONTACT OR "MAKE CONTACT" BY "I" SEE FIGURE BELOW.



THE CONTACT TERMINALS ARE NUMBERED CONSECUTIVELY FROM RIGHT TO LEFT FACING THE TERMINAL SIDE OF THE RELAY THE RELATIVE LOCATION OF THE WINDING TERMINALS AS VIEWED FROM THE TERMINAL SIDE AS SHOWN BELOW.

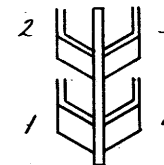


THE "FRONT CONTACT" OR "MAKE CONTACT" IS INDICATED BY "1", THE ARMATURE BY "A" AND THE "BACK CONTACT" OR "BREAK CONTACT" BY "2" SEE FIGURE BELOW.



(A) THE 4 SPRINGS OF A SEQ. SW. CAM ARE KNOWN AS LEFT OUTER, LEFT INNER, RIGHT OUTER, RIGHT INNER ACCORDING TO THEIR POSITION AS VIEWED FROM THE CAM SIDE. THE LEFT SIDE OF THE CAM IS THE SIDE NEAREST THE DRIVE OR "R" MAGNET AND THE SPRINGS ON THAT SIDE OF THE CAM ARE THE LEFT SPRINGS, THE 2 SPRINGS NEAREST THE CAM SPINDLE ARE THE INNER SPRINGS.

1 IS LEFT INNER
2 IS LEFT OUTER
3 IS RIGHT OUTER
4 IS RIGHT INNER



1 IS RIGHT INNER
2 IS RIGHT OUTER

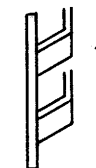


Diagram illustrating a door hinge assembly with two springs. The assembly is shown in a cross-sectional view. The door is on the left, and the frame is on the right. Two springs are shown: one labeled '1 SPRING' and another labeled 'SPRING 2'.

Diagram illustrating the 1 Type Clutch connection. The diagram shows four terminals arranged in a 2x2 grid, each with a specific symbol: a horizontal bar with a notch, a horizontal bar with a semi-circle, a circle with a diagonal line, and a circle with a horizontal line. The connections are labeled as follows:

- TRIP MAGNET → (Horizontal bar with notch)
- UP DRIVE → (Horizontal bar with semi-circle)
- DOWN DRIVE ← (Horizontal bar with semi-circle)
- COMMON CONNECTION ← (Circle with horizontal line)

1 TYPE CLUTCH

(A) FACING THE FRONT, OR ADJUSTING
END, THE INTERRUPTER CONTACT
SPRINGS ARE NUMBERED FROM
1 UP FROM FRONT TO REAR.

(B) FACING THE FRONT END, THE WINDING
CONNECTIONS ARE NAMED, "INNER
END" THE TERMINAL AT THE FRONT
AND "OUTER END" THE TERMINAL AT
THE REAR.

ISSUE	1	2					
DATE	2-15-55	4-6-55					
BY	NA S.	LEB					

- | | | |
|--------------|------------|------------------|
| FUNDAMENTALS | RM 000.003 | 1 SHEET, SHEET 1 |
|--------------|------------|------------------|

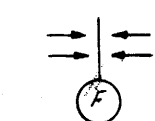
THE SYMBOLS AND DESIGNATIONS USED IN THE OPERATIONAL SKETCHES FOR THE "FUNDAMENTAL CIRCUITS" ARE TAKEN FROM BELL SYSTEM PRACTICES SECTION A 128.801, SECTION 950 701.01 AND SECTION A 804 002 AND APPEAR BELOW

OPERATIONAL SKETCHES (OS)

THE SYMBOLS AND CONVENTIONS USED ARE THE SAME AS THOSE USED ON STANDARD CIRCUIT SCHEMATIC DRAWINGS (SD-) WITH THE FOLLOWING EXCEPTIONS.

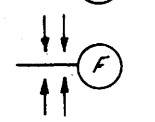
1. A SYMBOL MAY BE TURNED IN ANY DIRECTION WITHOUT AFFECTING ITS MEANING.

SYMBOL

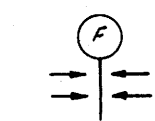


MEANING

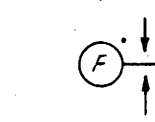
SPRING 2
SPRING 1



SPRING 3
SPRING 2

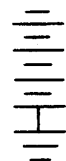


SPRING 4
SPRING 3



SPRING 1
SPRING 4

2. BATTERY (SD) SYMBOL



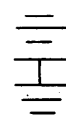
(OS) SYMBOL

-48

MEANING

NEGATIVE SIDE OF
48 VOLT POSITIVE
GROUNDED BATTERY

(SD) SYMBOL



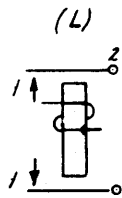
(OS) SYMBOL

-24

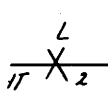
MEANING

NEGATIVE SIDE OF
24 VOLT POSITIVE
GROUNDED BATTERY.

3. MAKE CONTACTS (SD) SYMBOL



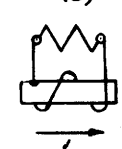
(OS) SYMBOL



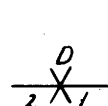
MEANING

CONTACTS ARE CLOSED
WHEN RELAY IS OPERATED.
CONTACTS ARE OPEN
WHEN RELAY IS UNOPERATED.
RELAY HAS TOP AND
BOTTOM SPRING PILE-UPS.

(SD) SYMBOL



(OS) SYMBOL

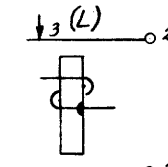


MEANING

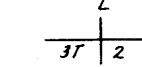
CONTACTS ARE CLOSED
WHEN RELAY IS OPERATED.
CONTACTS ARE OPEN
WHEN RELAY IS UNOPERATED.
RELAY HAS ONLY 1 AND 2
SPRING CONTACTS.

4. BREAK CONTACTS

(SD) SYMBOL



(OS) SYMBOL



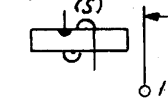
MEANING

CONTACTS ARE CLOSED WHEN RELAY IS UNOPERATED.

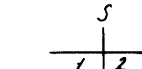
CONTACTS ARE OPEN WHEN RELAY IS OPERATED.

RELAY HAS TOP AND BOTTOM SPRING PILE-UPS.

(SD) SYMBOL



(OS) SYMBOL



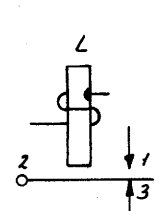
MEANING

CONTACTS ARE CLOSED WHEN RELAY IS UNOPERATED.

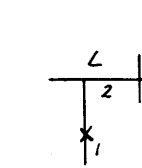
CONTACTS ARE OPEN WHEN RELAY IS OPERATED.
RELAY HAS ONLY 1 AND 2 SPRING CONTACTS

5. TRANSFER CONTACTS

(SD) SYMBOL



(OS) SYMBOL



MEANING

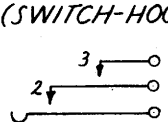
THE SINGLE NUMBER IS SHOWN FOR THE FIXED SPRING.

NO DOT IS SHOWN AT THE JUNCTION POINT.

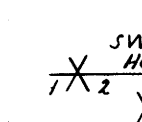
THE RELAY DESIGNATION IS AT THE JUNCTION POINT.

6. OTHER CONTACTS

(SD) SYMBOL



(OS) SYMBOL



MEANING

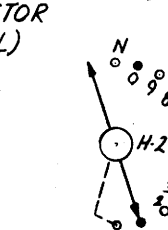
NO DOT IS SHOWN AT THE JUNCTION POINT.

THE APPARATUS DESIGNATION IS AT THE JUNCTION POINT.

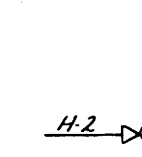
THE CONTACT SEQUENCE IS COVERED IN A NOTE.

7. ROTARY TYPE SWITCH OR SELECTOR (SIMPLE SYMBOL)

(SD) SYMBOL



(OS) SYMBOL



MEANING

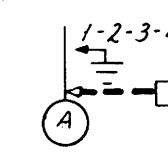
THE ARROW IS THE ROTAR BRUSH - "H" IS THE ROTARY SELECTOR -

"2" IS THE ARC OF THE ROTARY SELECTOR

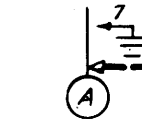
THE CIRCLE IS THE TERMINAL AND "1" INDICATES THE TERMINAL NUMBER.

8. SEQUENCE SWITCH CAMS

(SD) SYMBOL



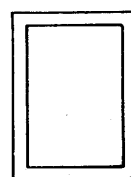
(OS) SYMBOL



MEANING

THE "A" CAM BRUSH "2" IS SHOWN IN THE "OS" SYMBOL WHEN IT MAKES WITH THE CAM TO ADVANCE THE SEQ. SW. OUT OF A PASS BY POSITION.

9.



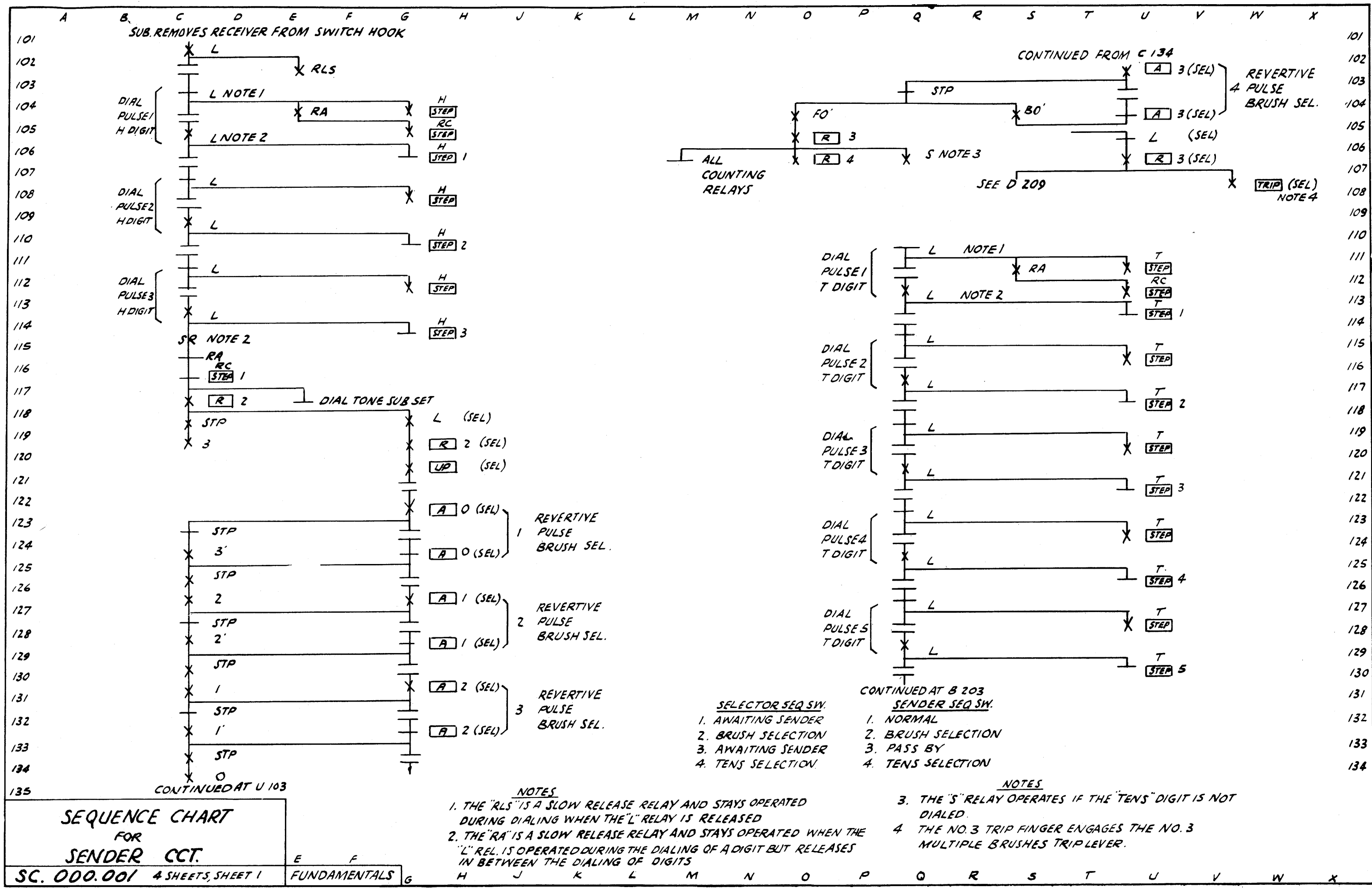
THIS INDICATES COMPLETE OR PORTION OF OTHER CIRCUIT IN ORDER TO MAKE CIRCUIT PATH COMPLETE AND TO GIVE A GENERAL UNDERSTANDING OF THE CIRCUITS.

10. RELAY WINDINGS

RELAY WINDINGS ARE NOT SHOWN.

OPERATIONAL SKETCHES FUNDAMENTAL CIRCUITS

ISSUE	1	2	4-6-55	LEB
DATE	2-16-55	4-6-55	4-6-55	4-6-55
BY	N.A.S.	N.A.S.	N.A.S.	N.A.S.

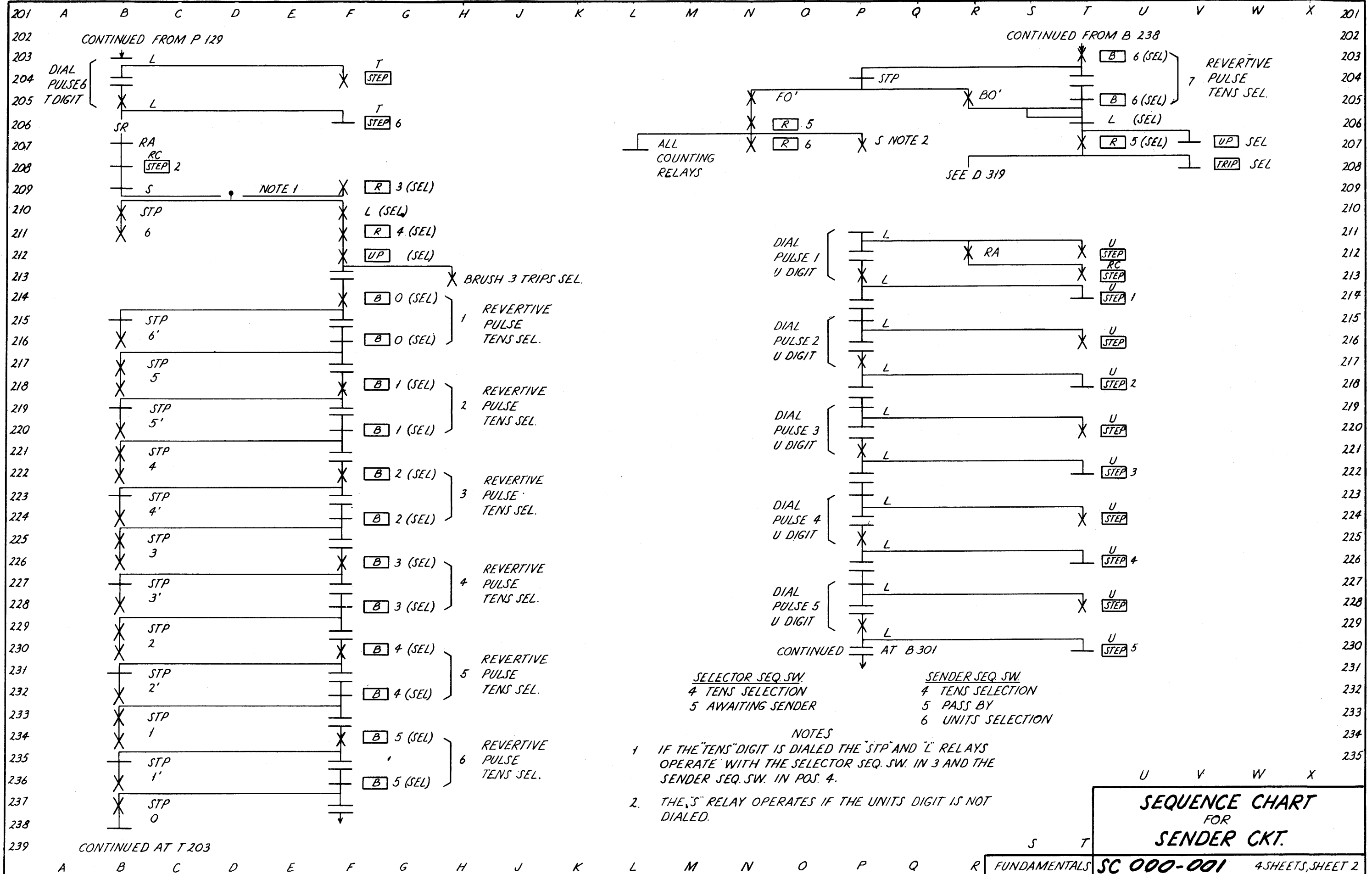


ISSUE	1	2	3	4	5	6	7	8	9	10
DATE	2-8-55	4-7-55								
BY	N.A.S.	LEB.								

SC.000.001

SC 000.001

ISSUE	1	2		
DATE	2-5-55	4-6-55		
BY	NAS	LEB		



SC.000.001

ISSUE	1	2		
DATE	2-9-55	4-6-55		
BY	N.A.S.			

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
	CONTINUED FROM P 336					CONTINUED FROM B 436																	
401	X	STEP				X	STEP															401	
402		T	7				RC															402	
403	X	STEP				X	STEP															403	
404		T	8				RC															404	
405	X	STEP				X	STEP															405	
406		T	9				RC															406	
407	X	STEP					STEP															407	
408		T	10				RC															408	
409	X	STEP					RC															409	
410		T	N				RC															410	
411	X	STEP					RC															411	
412		T	4				RC															412	
413	X	STEP					RC															413	
414		T	5				RC															414	
415	X	STEP					RC															415	
416		T	6				RC															416	
417	X	STEP					RC															417	
418		T	7				RC															418	
419	X	STEP					RC															419	
420		T	8				RC															420	
421	X	STEP					RC															421	
422		T	9				RC															422	
423	X	STEP					RC															423	
424		T	10				RC															424	
425	X	STEP					RC															425	
426		T	N				RC															426	
427	X	STEP					RC															427	
428		T	4				RC															428	
429	X	STEP					RC															429	
430		T	5				RC															430	
431	X	STEP					RC															431	
432		T	6				RC															432	
433	X	STEP					RC															433	
434		T	7				RC															434	
435	X	STEP					RC															435	
436		T	8				RC															435	
437		CONTINUED AT G 401																					
438																							
	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X

SEQUENCE CHART
FOR
SENDER CKT.

FUNDAMENTALS

S.C. 000-001 4 SHEETS, SHEET 4

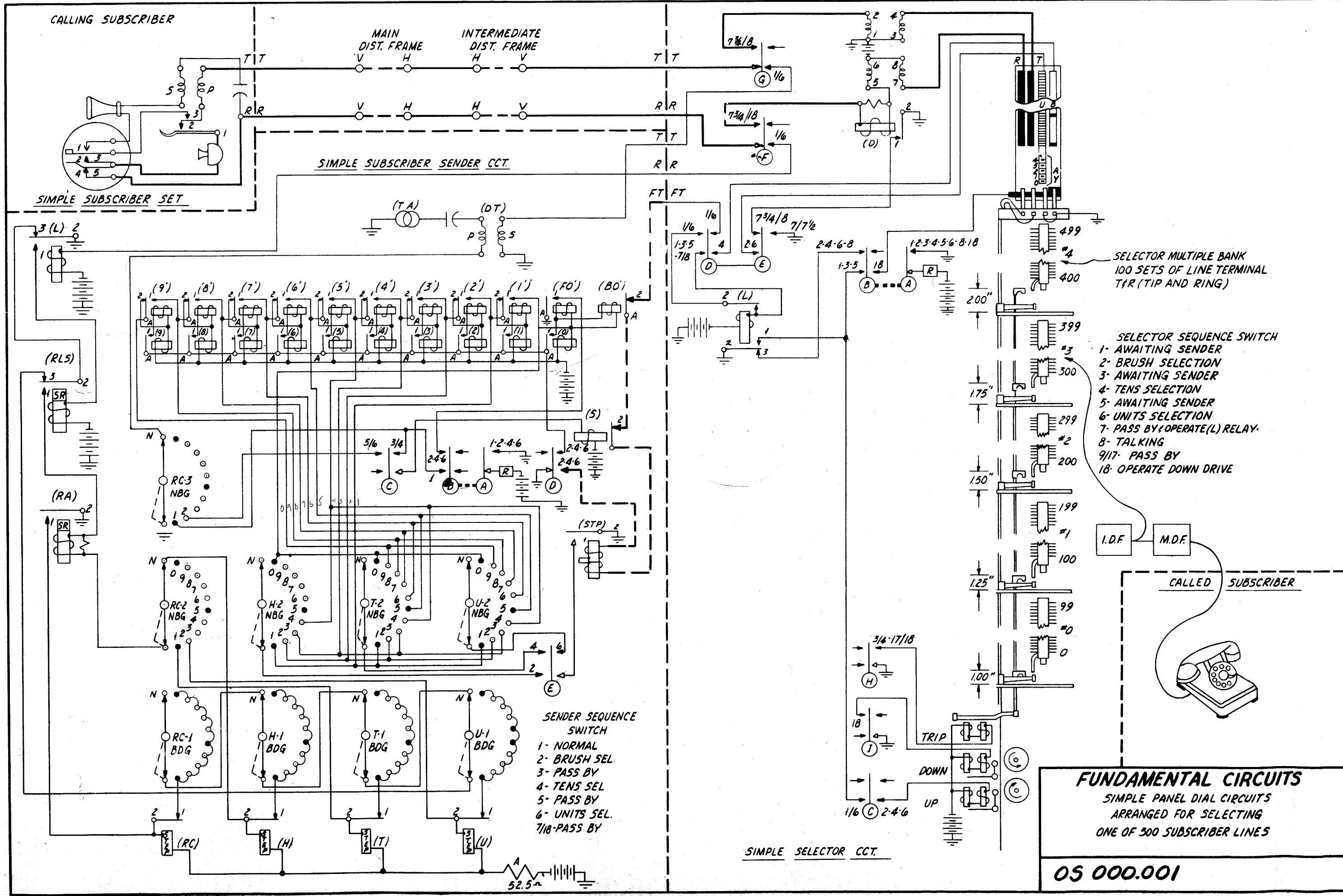
SEQUENCE CHART
FOR
SENDER CKT.

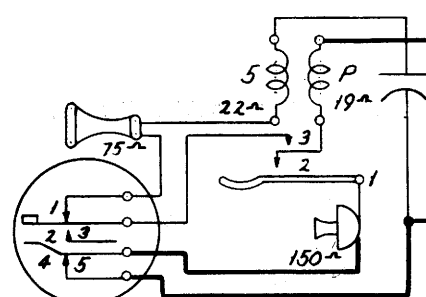
FUNDAMENTALS

SC.000-001 4 SHEETS, SHEET 4

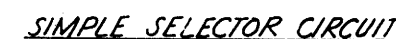
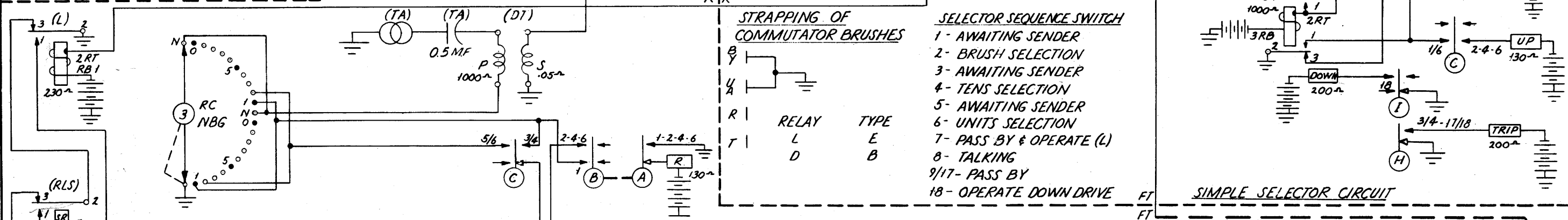
OS 000.001

ISSUE	DATE	BY
1	12-31-54	N.A.S. LEB
2	4-6-55	

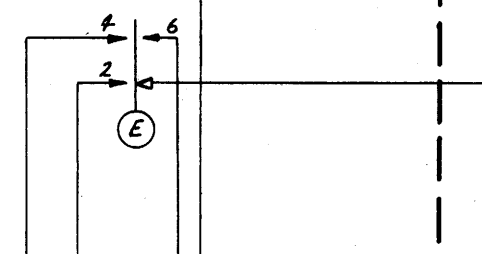




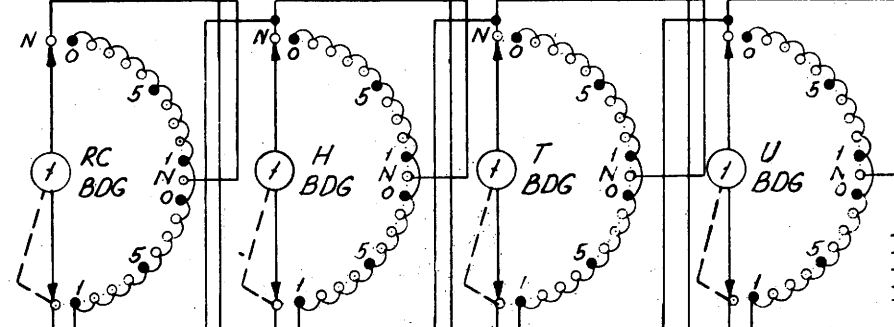
SIMPLE SUBSCRIBER SET



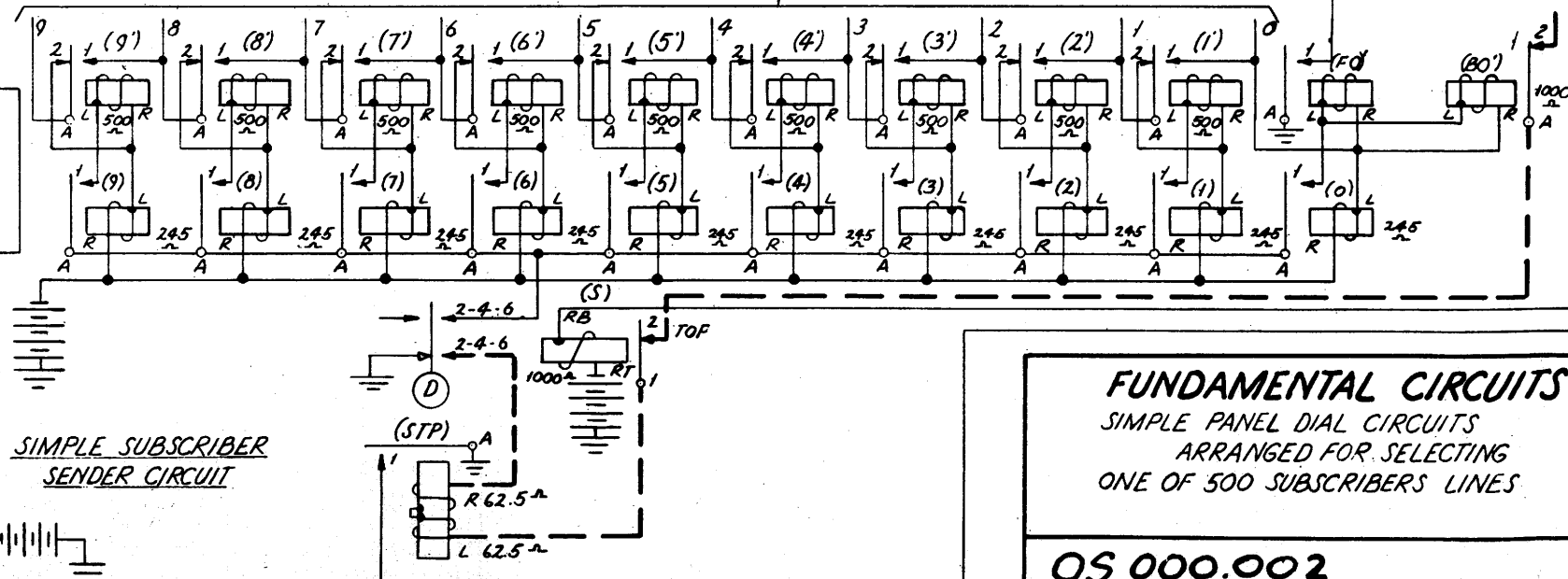
- 1 - NORMAL
- 2 - BRUSH SELECTION
- 3 - PASS BY
- 4 - TENS SELECTION
- 5 - PASS BY
- 6 - UNITS SELECTION
- 7/18 - PASS BY



RELAY	TYPE
L	L
S	E
STP	207
RA	178
RLS	149
Oro 9	208
i'ro 9'	208
BO'	208
FO'	208



SIMPLE SUBSCRIBER SENDER CIRCUIT



FUNDAMENTAL CIRCUITS

SIMPLE PANEL DIAL CIRCUITS
ARRANGED FOR SELECTING
ONE OF 500 SUBSCRIBERS LINES

ISSUE	DATE	BY
-------	------	----

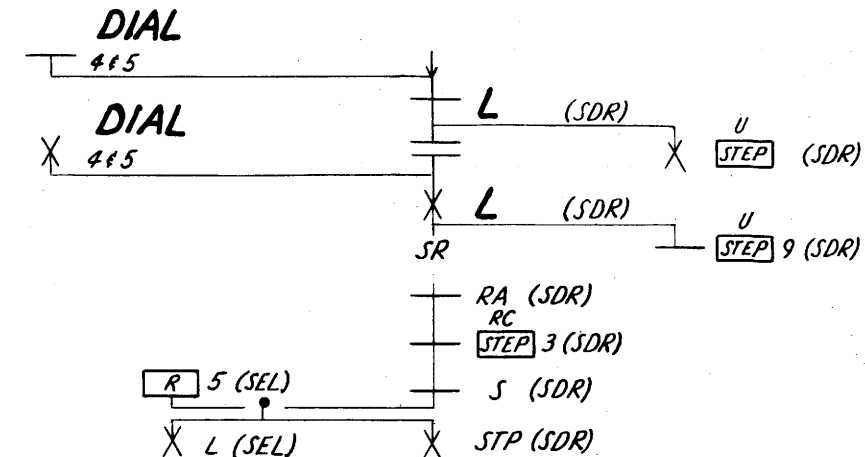
SEQUENCE CHART - TENS DIGIT 6

SEQUENCE CHART - UNITS DIGIT 9

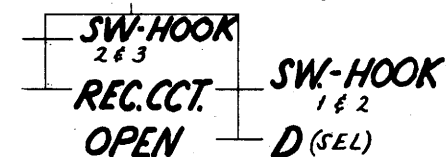
SUB. MOVES DIAL OFF-NORMAL IN ORDER TO DIAL 6

SUB. MOVES DIAL OFF-NORMAL IN ORDER TO DIAL 9

DIAL PULSE 9 U DIGIT

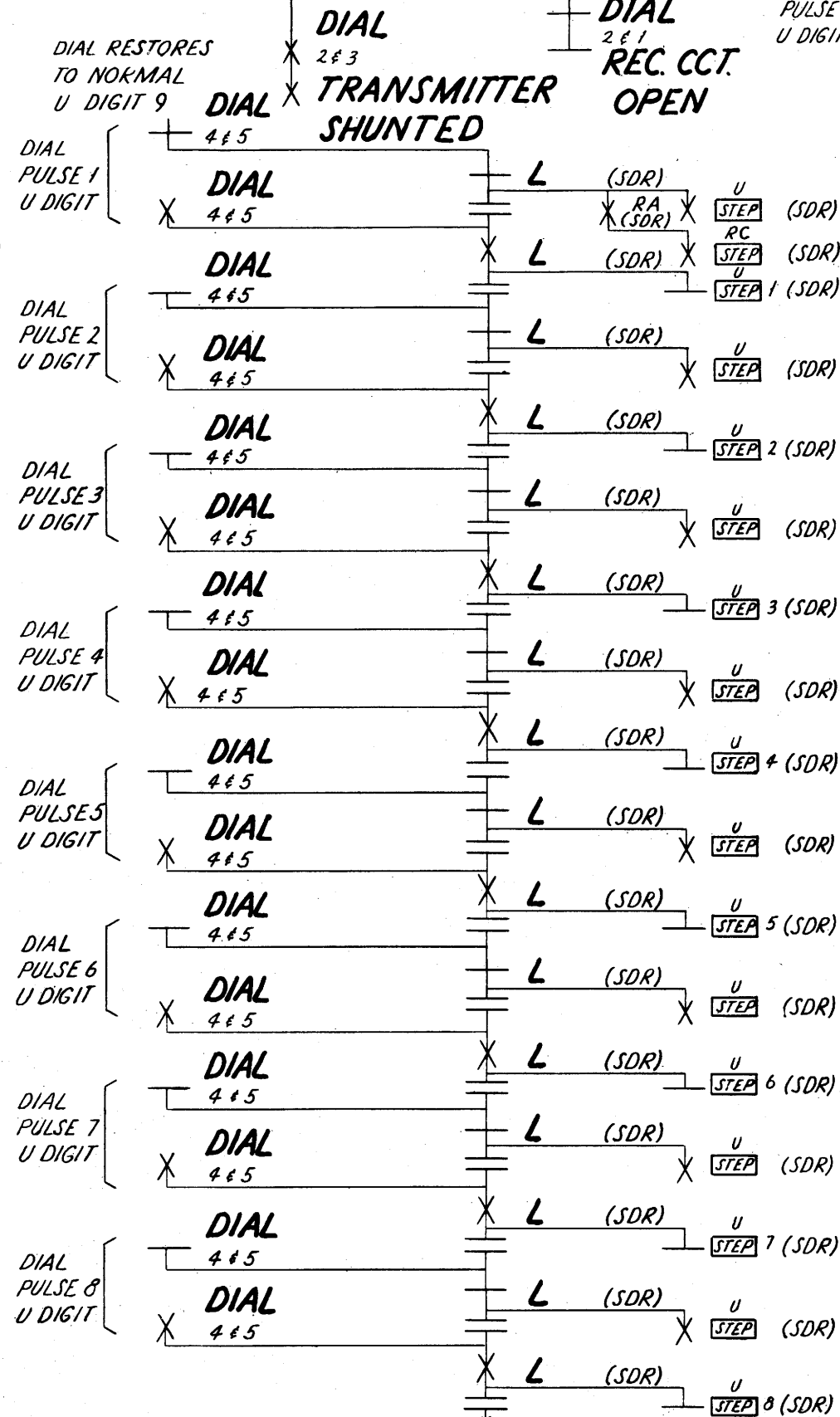
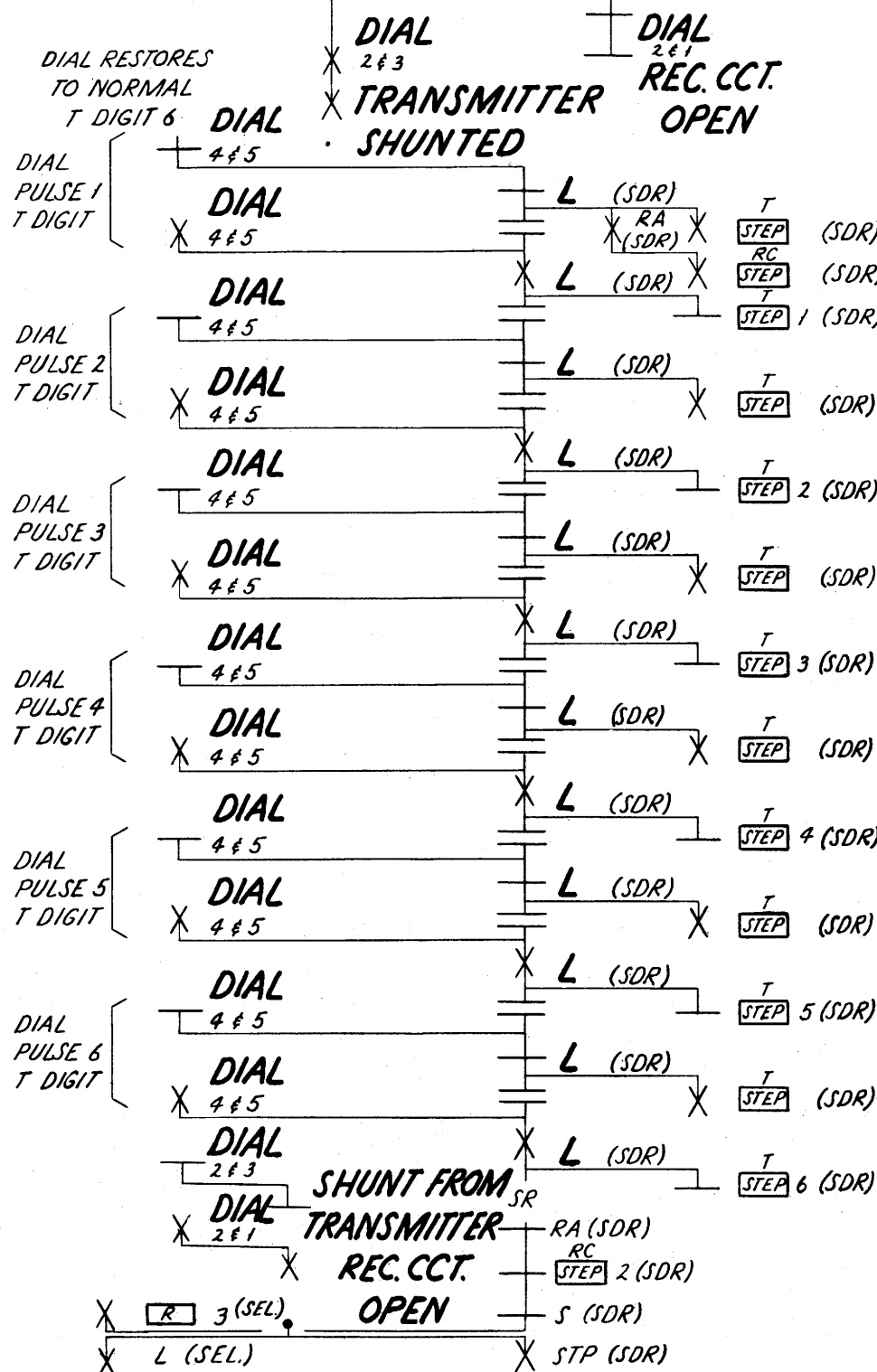


SUB. REPLACES RECEIVER ON SWITCH-HOOK



O.S. 000-003

ISSUE	1	2
DATE	2-3-55	4-6-55
BY	N.S.	



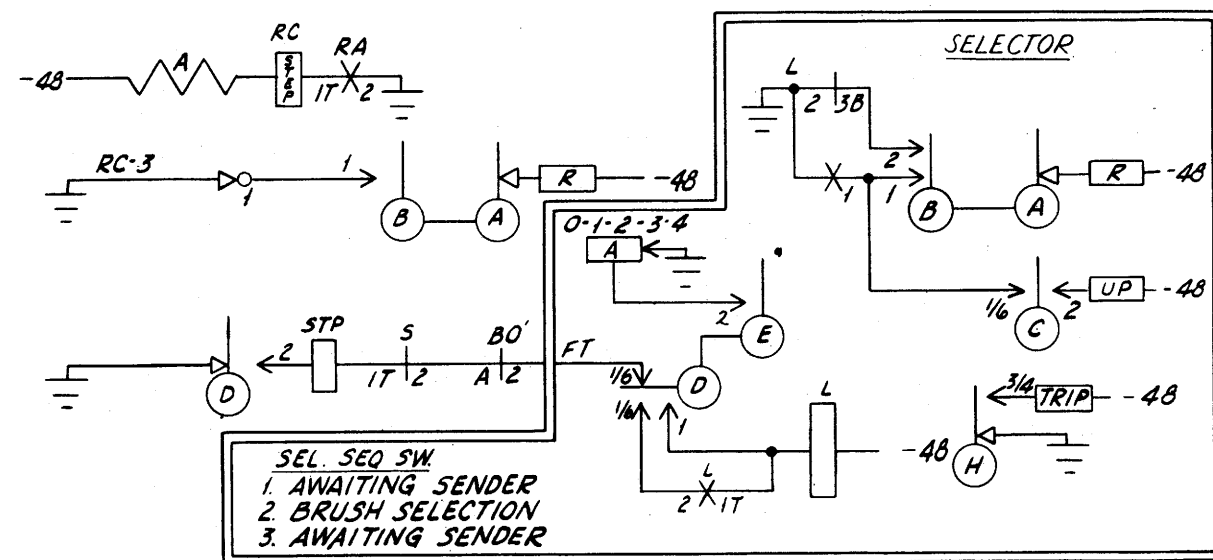
SUBSCRIBER SET

DIALING TENS DIGIT 6
DIALING UNITS DIGIT 9
RESTORING RECEIVER TO SWITCH-HOOK

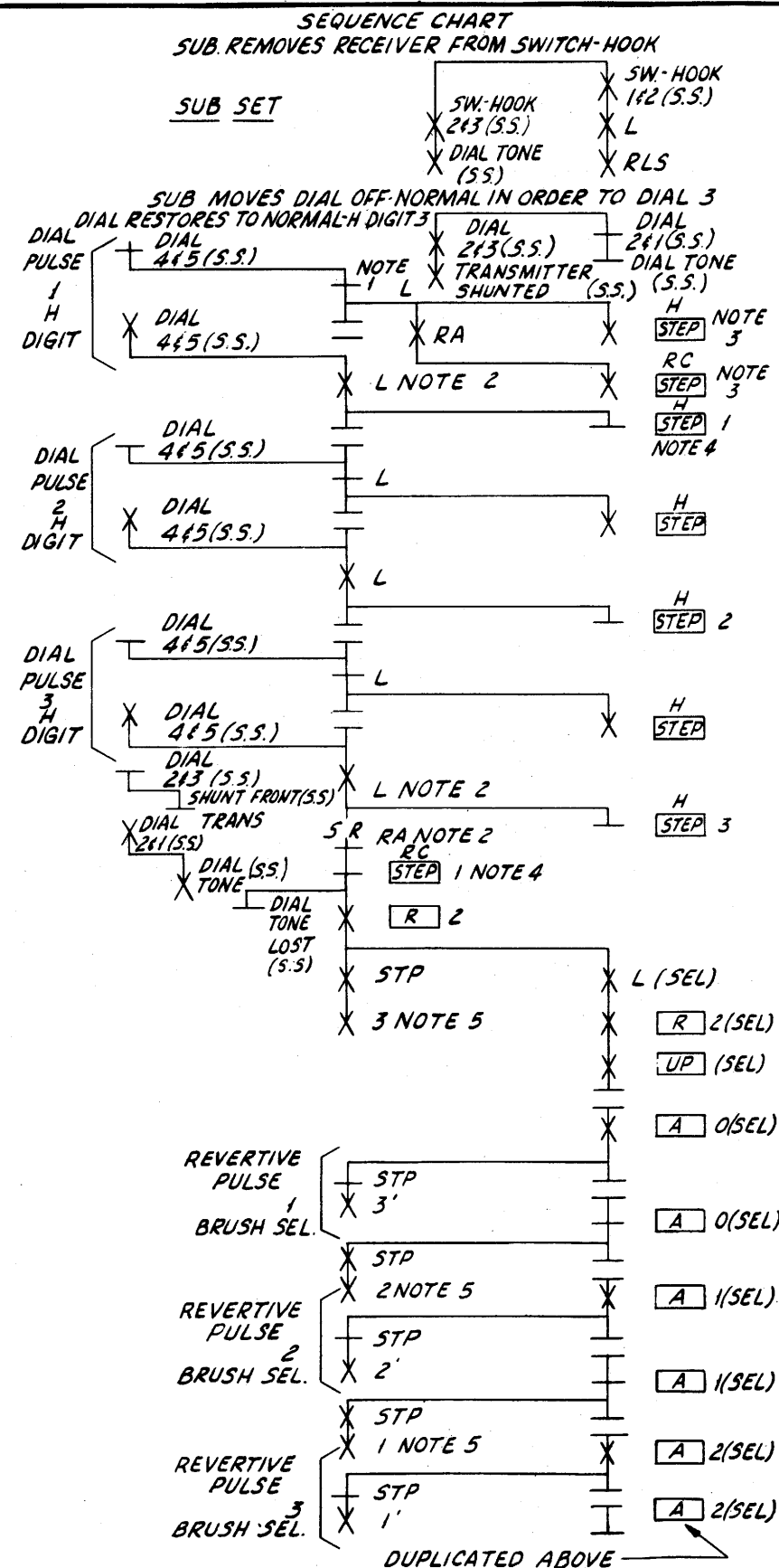
FUNDAMENTALS

O.S. 000-003

2 SHEETS, SHEET 2



1. THE RLS RELAY IS A SLOW RELEASE TYPE RELAY AND STAYS OPERATED BY ITS SLOW RELEASE FEATURE DURING DIALING WHEN THE "L" RELAY IS RELEASED.
2. THE "RA" RELAY IS A SLOW RELEASE TYPE RELAY AND STAYS OPERATED BY ITS SLOW RELEASE FEATURE WHEN THE "L" TYPE RELAY IS OPERATED DURING THE DIALING OF A DIGIT, BUT RELEASES IN BETWEEN THE DIALING OF DIGITS AND AFTER THE LAST DIGIT IS DIALED.
3. THE "H" AND "RC" MAGNETS WHEN ENERGIZED WILL NOT CAUSE THE "H" AND "RC" SWITCHES TO STEP TO THE NEXT SET OF TERMINALS.
4. THE "H" AND "RC" MAGNETS WHEN DEENERGIZED WILL CAUSE THE "H" AND "RC" SWITCHES TO STEP THE SWITCH TO THE NEXT SET OF TERMINALS.
5. THE PRIME COUNTER DOES NOT OPERATE AS IT IS SHUNTED.
6. THE PRIME COUNTERS DO NOT OPERATE AS THEY ARE SHUNTED
7. THE "S" OPERATES BECAUSE THE "TENS" DIGIT IS NOT DIALED THE "S" OPERATED OPENS THE "FT" LEAD AND NO GROUP SELECTION CAN BE MADE UNTIL THE "TENS" DIGIT IS DIALED.

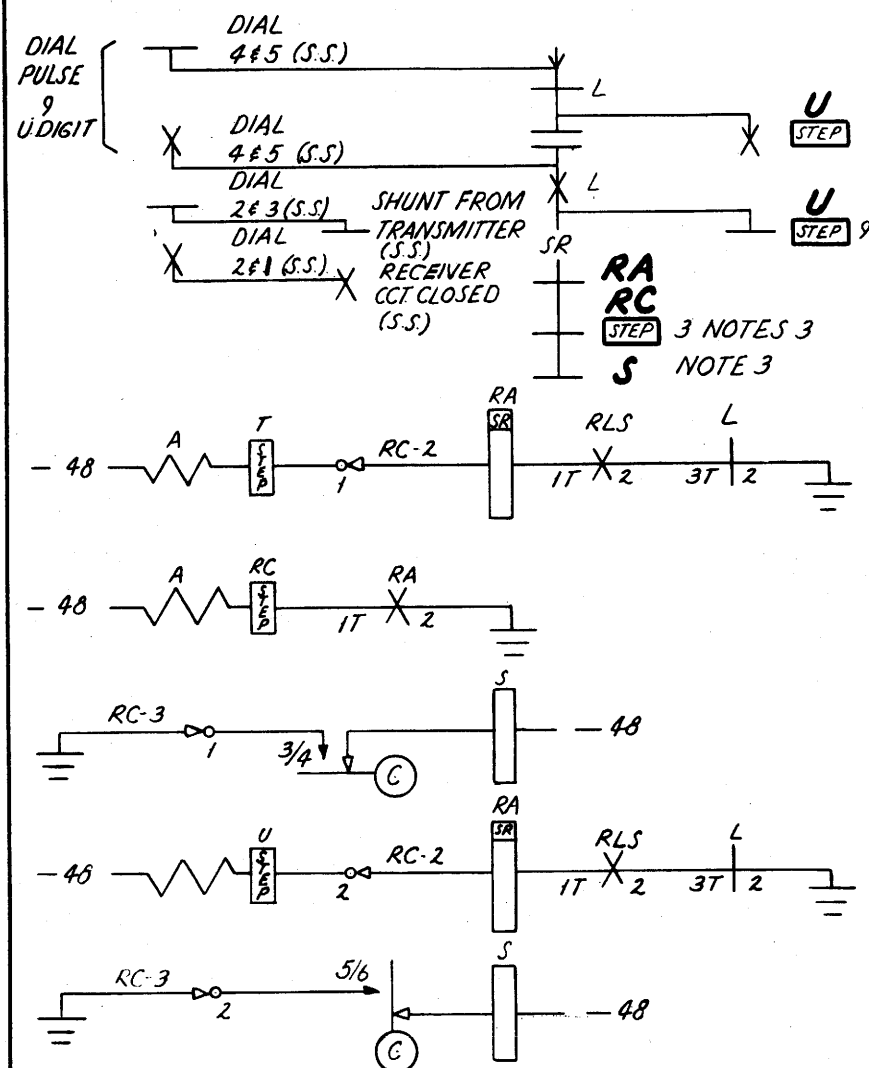


**SENDER
RECEIVING H. DIGIT 3, DIAL PULSES
BRUSH SELECTION**

05 000.005

ISSUE	1	2				
DATE	2-17-55	4-6-55				
BY	NAS	LEB				

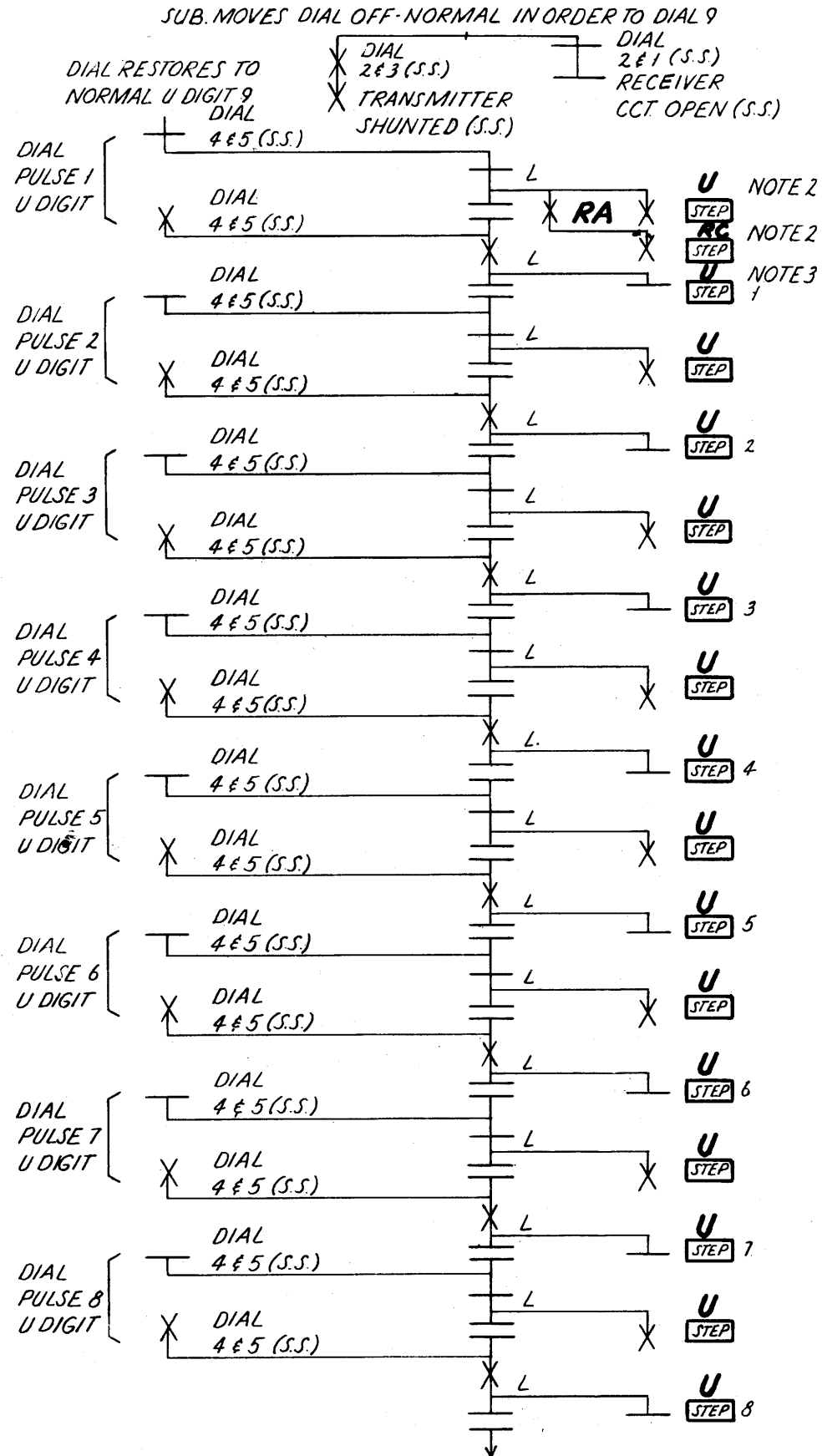
SENDER



NOTES

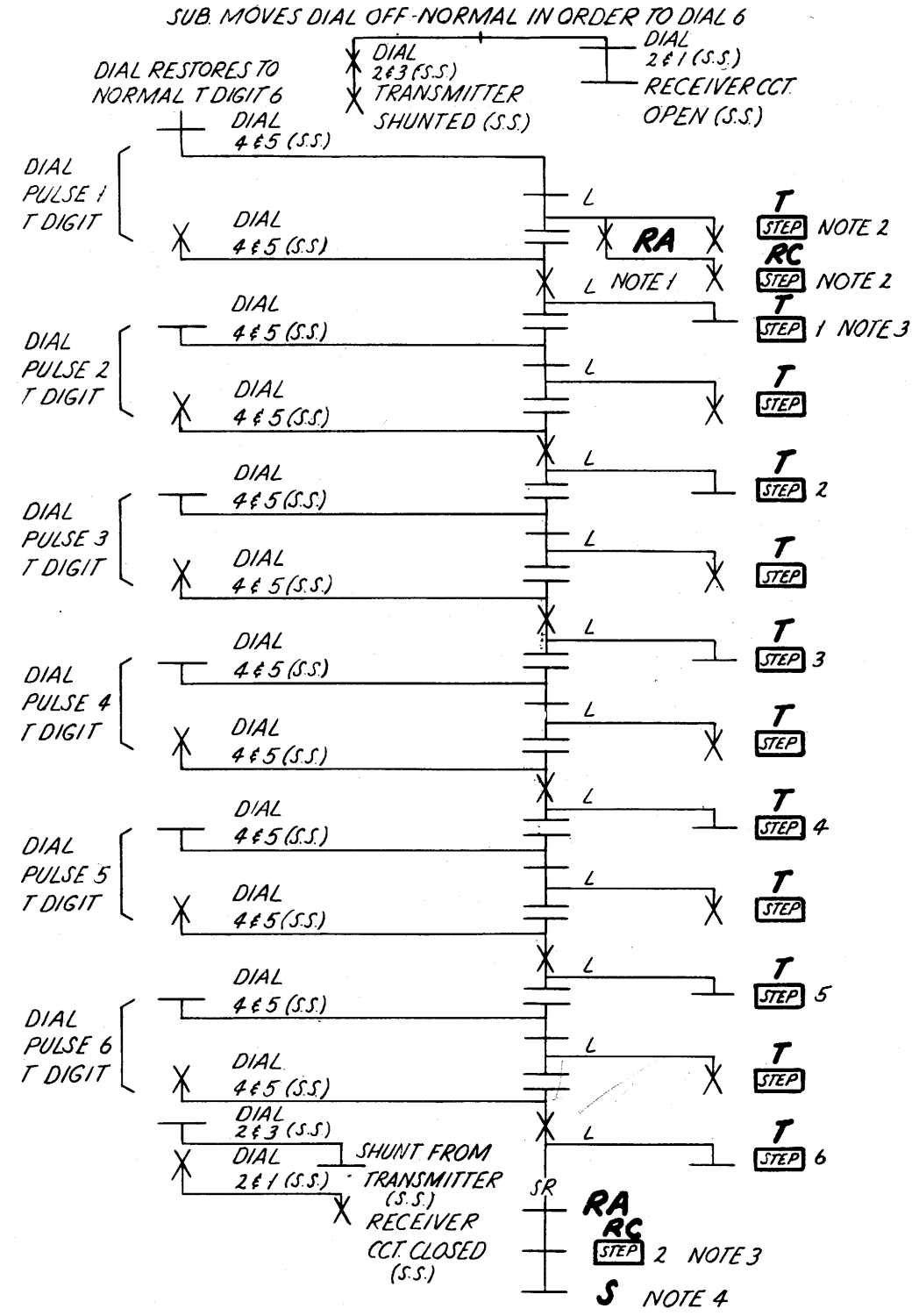
1. THE "RA" IS A SLOW RELEASE RELAY AND STAYS OPERATED BY ITS SLOW RELEASE FEATURE WHEN THE "L" RELAY IS OPERATED DURING THE DIALING OF A DIGIT, BUT RELEASES IN BETWEEN THE DIALING OF DIGITS AND AFTER THE LAST DIGIT IS DIALED.
2. THE "T" "U" AND "RC" MAGNETS WHEN ENERGIZED WILL NOT CAUSE THE "T" "U" AND "RC" SWITCHES TO STEP TO THE NEXT SET OF TERMINALS.
3. THE "T" "U" AND "RC" MAGNETS WHEN DE-ENERGIZED WILL CAUSE THE "T" "U" AND "RC" SWITCHES TO STEP TO THE NEXT SET OF TERMINALS.
4. THE "S" RELAY RELEASES BECAUSE THE "TENS" DIGIT IS DIALED
5. THE "S" RELAY RELEASES BECAUSE THE "UNITS" DIGIT IS DIALED.

SEQUENCE CHARTS UNITS DIGIT 9



CONTINUED ABOVE UPPER LEFT

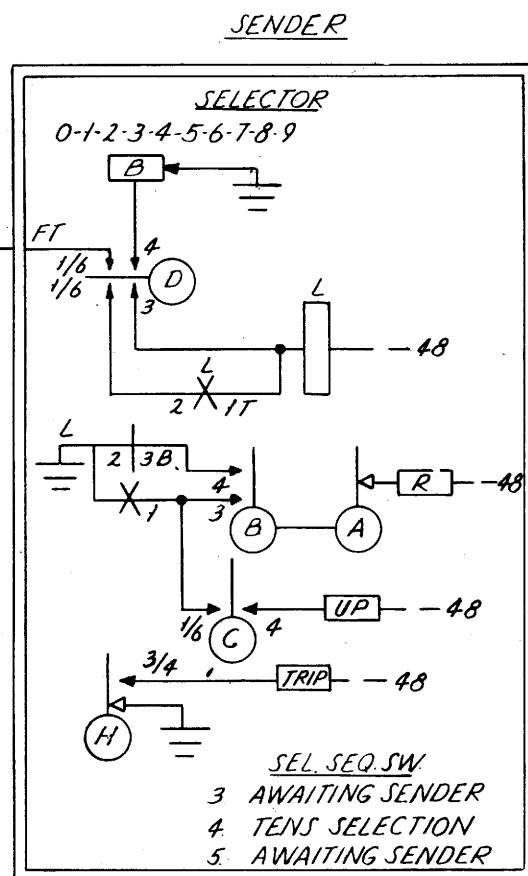
SEQUENCE CHART - TENS DIGIT 6



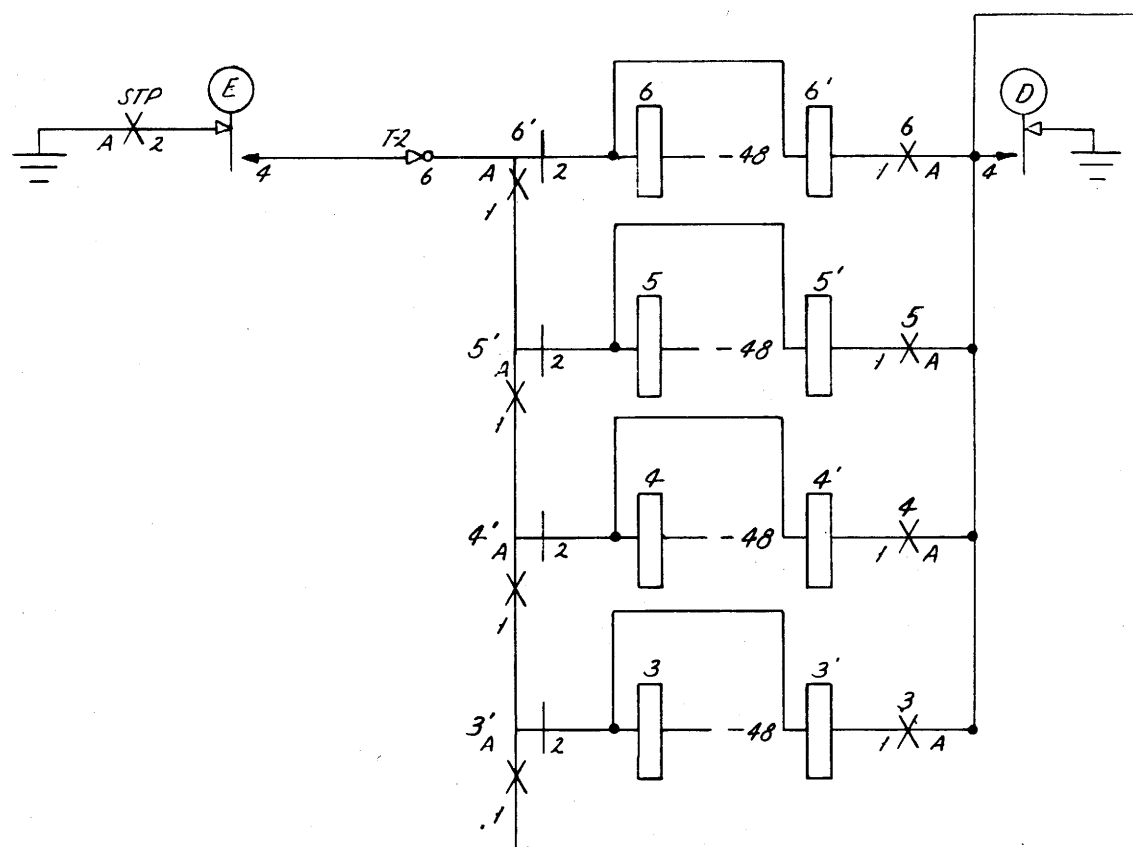
SENDER
RECEIVING T DIGIT 6
RECEIVING U DIGIT 9



1. THE PRIME COUNTER DOES NOT OPERATE AS IT IS SHUNTED.
2. THE PRIME COUNTERS DO NOT OPERATE AS THEY ARE SHUNTED.
3. THE "S" RELAY OPERATES BECAUSE THE "UNITS" DIGIT IS NOT DIALED. THE "S" OPERATED OPENS THE "FT" LEAD AND NO GROUP SELECTION CAN BE MADE UNTIL THE "UNITS" DIGIT IS DIALED.
4. IF THE "TENS" DIGIT IS DIALED THE "STP" AND "L" RELAYS OPERATE WITH THE SELECTOR SEQ. SW. IN POSITION 3 AND THE SENDER SEQ. SW. IN POSITION 4.



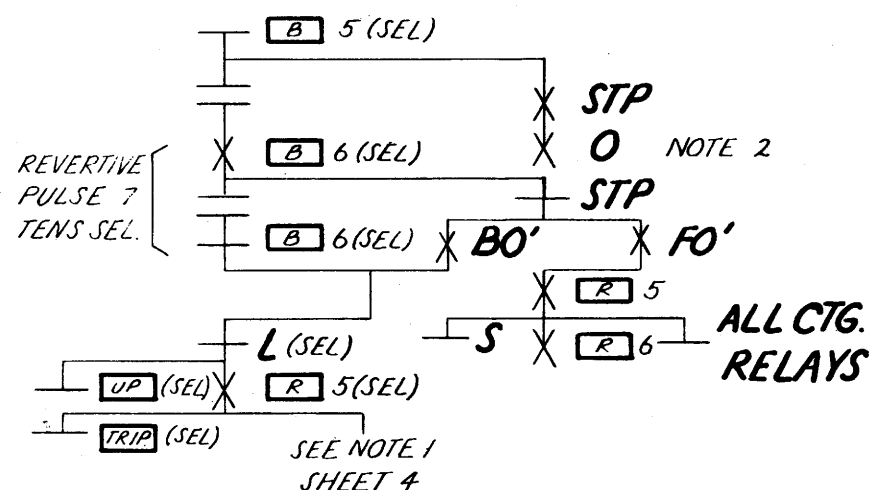
SEL. SEQ. SW.
3 Awaiting sender
4 TENS SELECTION
5 Awaiting sender



SENDER SEQ. SW.

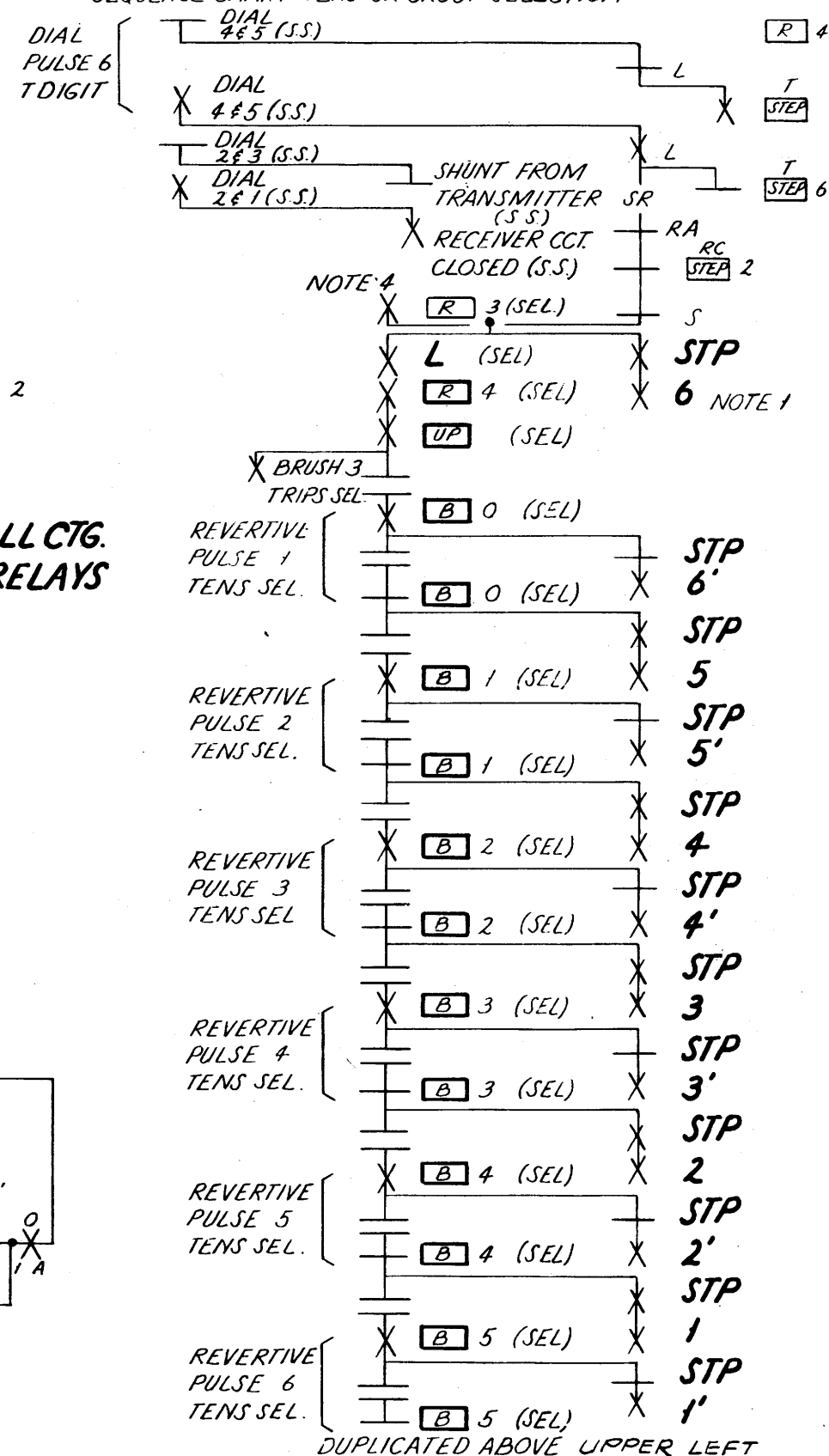
4. TENS SELECTION
5. PASS BY
6. UNITS SELECTION

STRAPPING OF COMMUTATOR BRUSHES



**ALL CTG.
RELAYS**

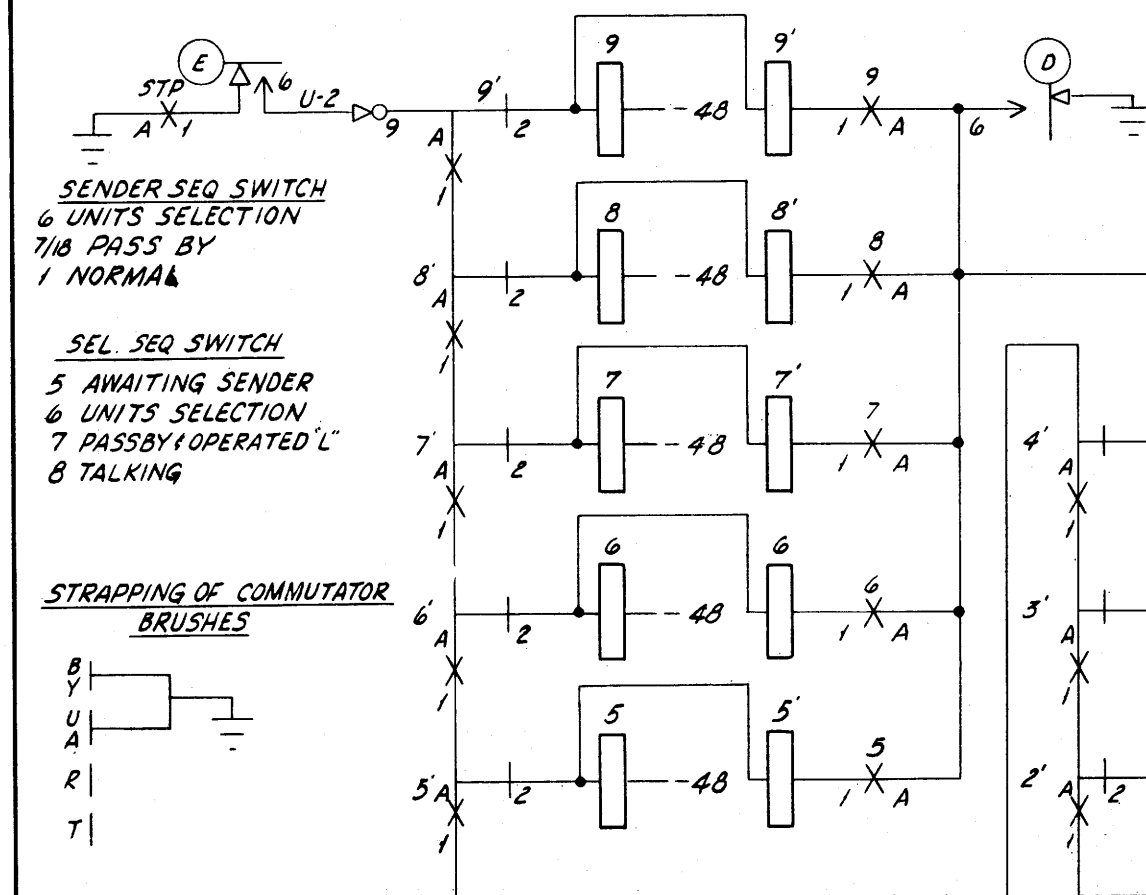
SEQUENCE CHART-TENS OR GROUP SELECTION



DUPLICATED ABOVE UPPER LEFT

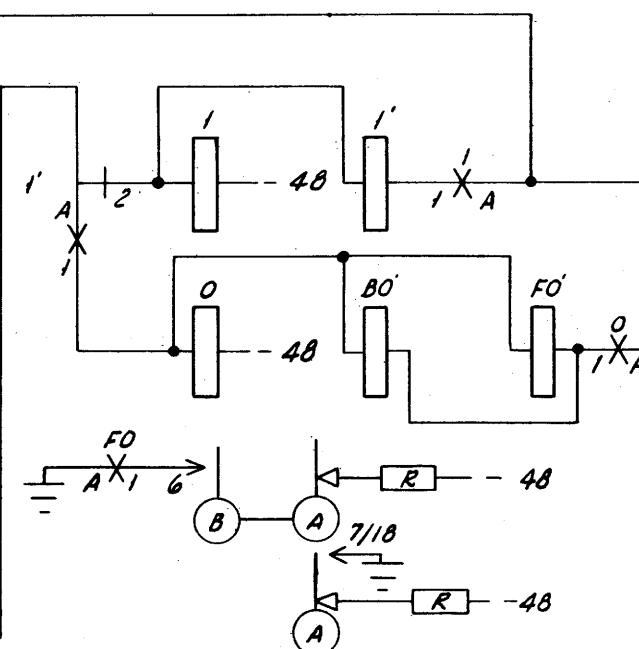
**SENDER
GROUP OR TENS SELECTION**

ISSUE	1	2			
DATE	12-31-54	4-6-55			
BY	N.S.	LEB			



The diagram shows the timing sequence for the U digit of a 10-unit relay. It includes the following components and signals:

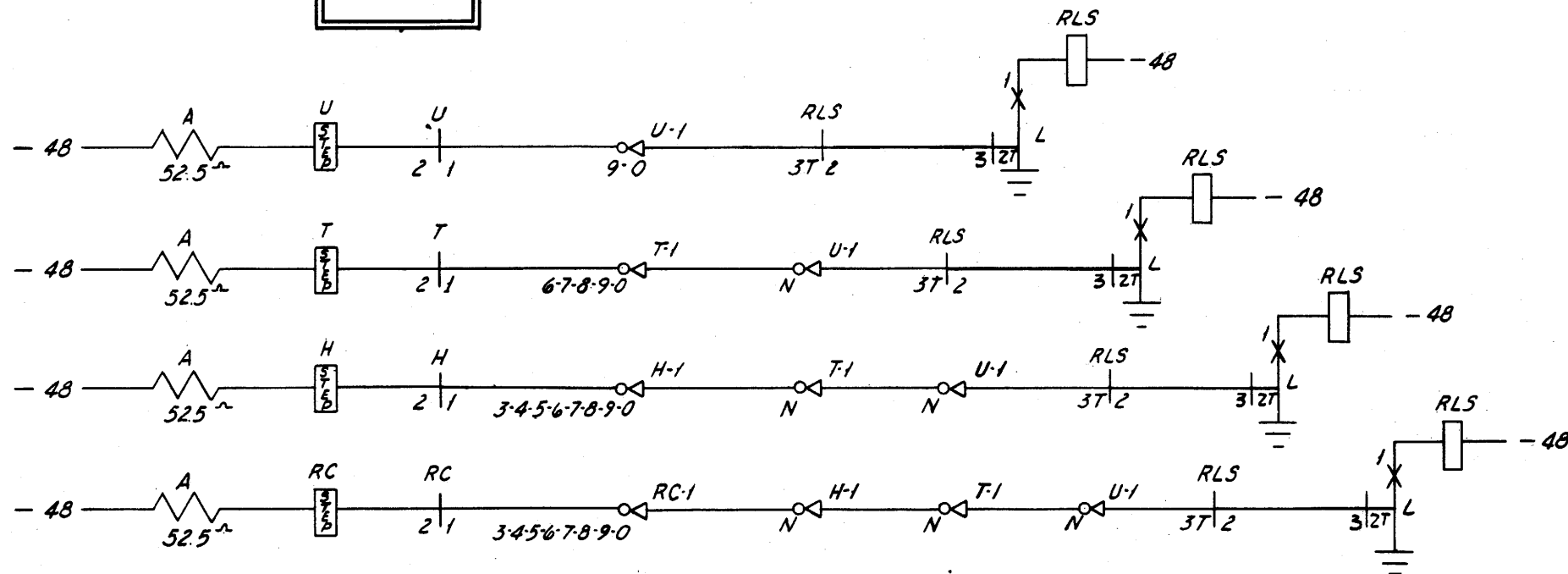
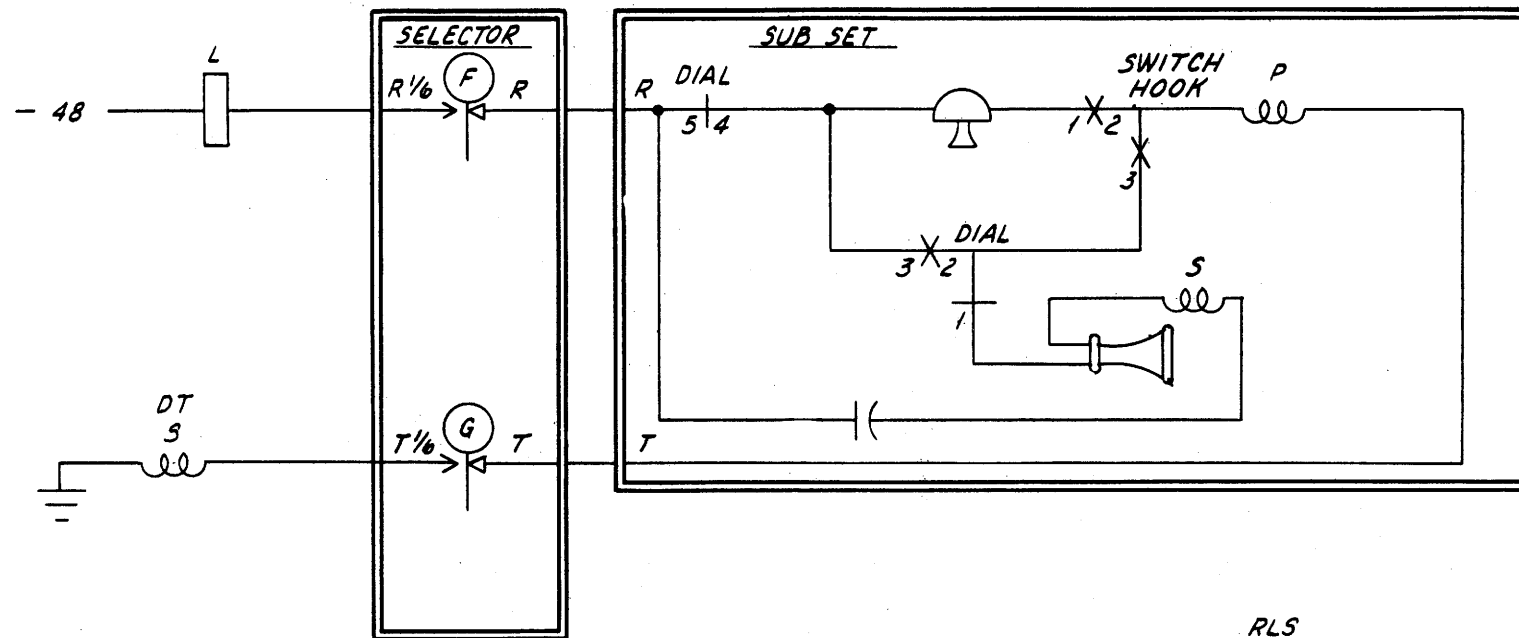
- Inputs:**
 - REVERTIVE PULSE 7 UNITS SEL.
 - REVERTIVE PULSE 8 UNITS SEL.
 - REVERTIVE PULSE 9 UNITS SEL.
 - REVERTIVE PULSE 10 UNITS SEL.
 - UP (SEL)
 - L (SEL)
 - D (SEL)
- Internal Relays and Contacts:**
 - U 5(SEL)
 - U 6(SEL)
 - U 7(SEL)
 - U 8(SEL)
 - U 9(SEL)
 - U 9(SEL) (labeled BO')
 - L (SEL)
 - R 7(SEL)
 - R 8(SEL)
 - R 7 (labeled FO')
 - R 1
- Outputs and Timing:**
 - STP 3
 - STP 3'
 - STP 2
 - STP 2'
 - STP 1
 - STP 1'
 - STP 0
 - STP (labeled BO')
 - FO'
- Annotations:**
 - DIAL PULSE 9 U DIGIT
 - ALL CTG RELAYS



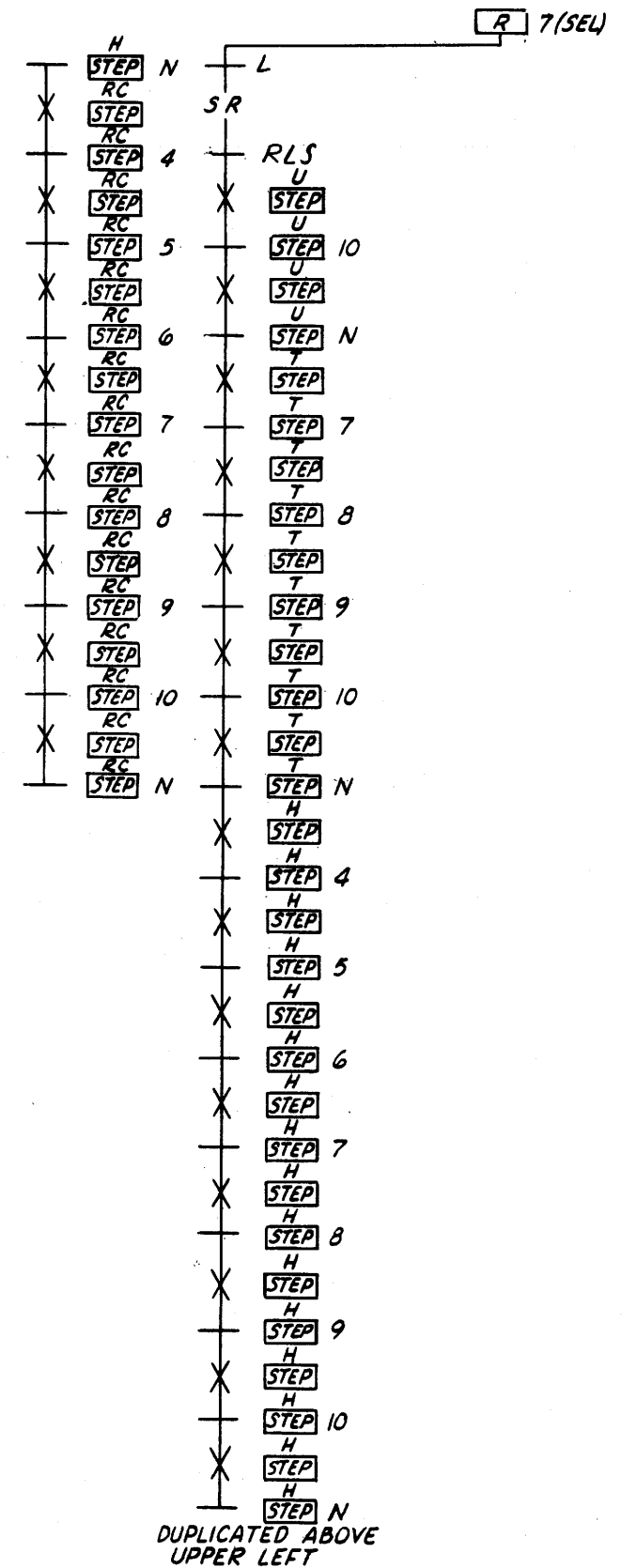
05 000-008

ISSUE	1	2		
DATE	2-11-55	4-6-55		
BY	N.S.	LEB		

SENDER



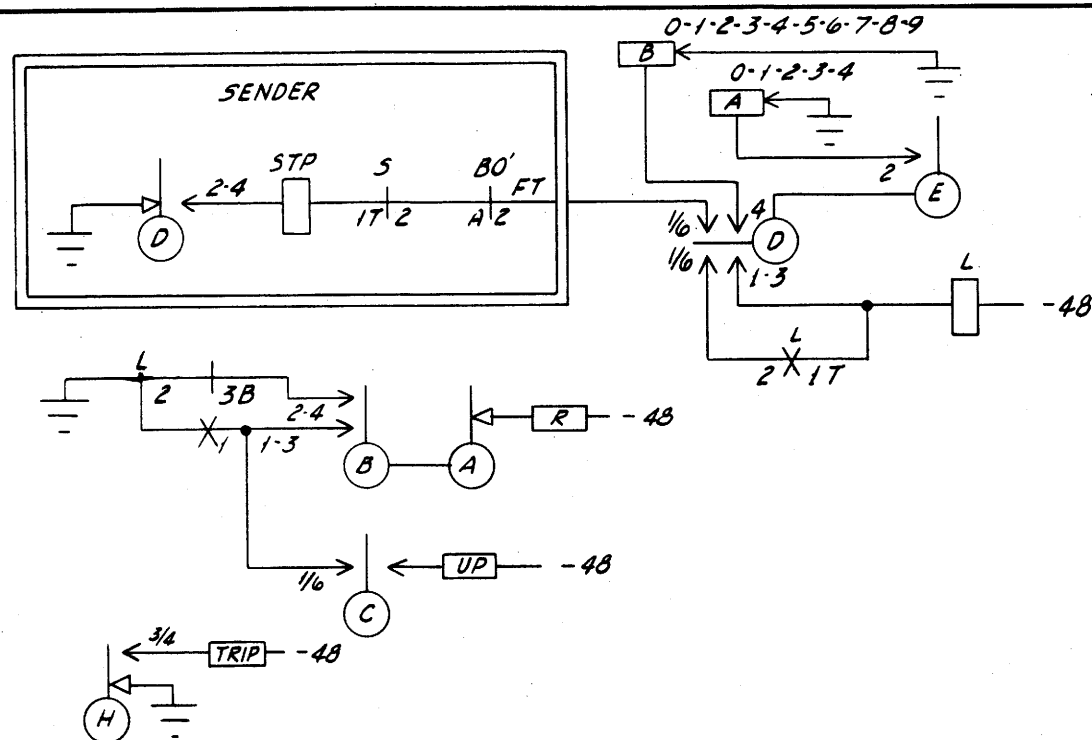
SEQUENCE CHART



DUPLICATED ABOVE
UPPER LEFT

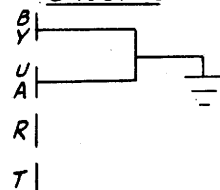
SENDER
RESTORING TO NORMAL

ISSUE	1	2	4-6-55	LEB
DATE	12-31-54		N.S.	
BY				



SELECTOR SEQ. SW.
 1. AWAITING SENDER
 2. BRUSH SELECTION
 3. AWAITING SENDER
 4. TENS SELECTION
 5. AWAITING SENDER

STRAPPING OF COMMUTATOR BRUSHES

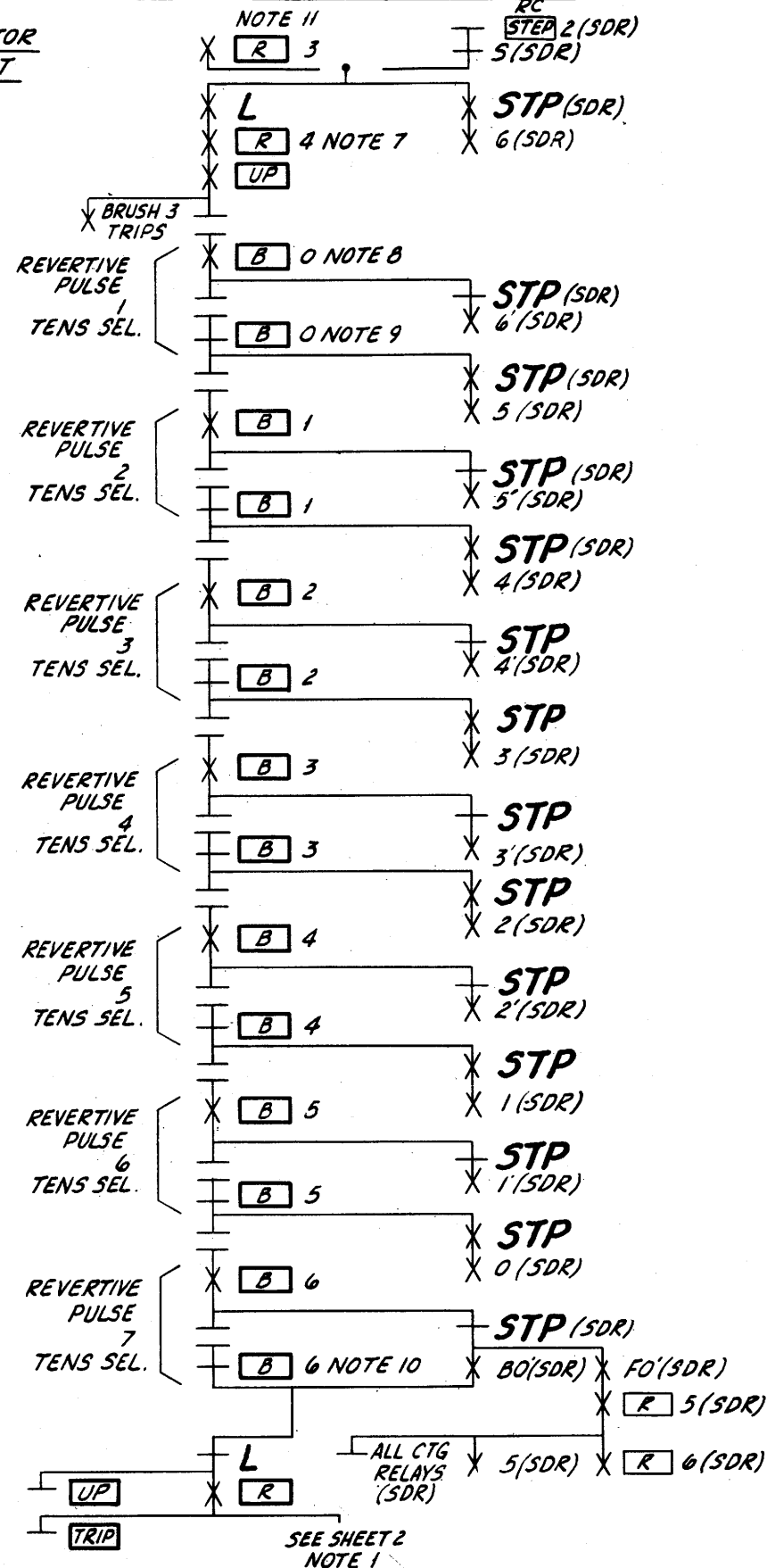


SENDER SEQ. SW.
 2. BRUSH SELECTION
 3. PASS BY
 4. TENS SELECTION
 5. PASS BY
 6. UNIT SELECTION

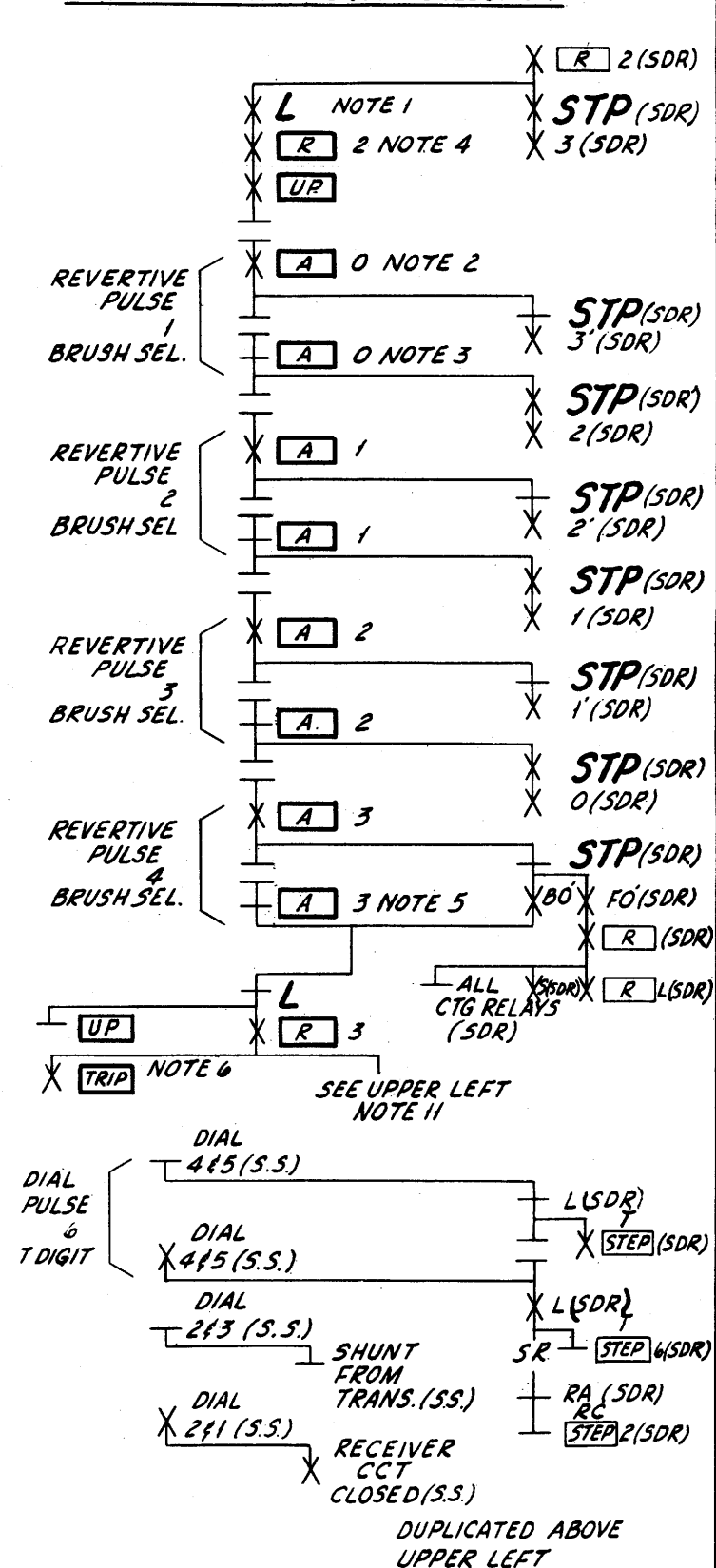
NOTES:

1. WHEN THE "L" RELAY OPERATES IT LOCKS TO GROUND ON THE "FT" LEAD COMING FROM THE SENDER. THIS IS THE "L" RELAY'S FIRST LOCKING PATH.
2. WHEN THE "A" COMMUTATOR BRUSH MAKES ON AN "A" SEGMENT THE "L" RELAY HAS A SECOND LOCKING PATH.
3. WHEN THE "A" COMMUTATOR BRUSH BREAKS FROM AN "A" SEGMENT THE "L" RELAY LOSES ITS SECOND LOCKING PATH.
4. WHEN THE SELECTOR SEQ. SW. ADVANCES TO 2 THE "L" RELAY LOSES ITS OPERATING PATH BUT STAYS OPERATED BY ITS LOCKING PATH ONE.
5. WHEN THE "BO" RELAY OPERATES IN THE SENDER CKT THE "FT" LEAD IS OPENED AND THE "L" RELAY LOSES ITS FIRST LOCKING PATH. WHEN THE "A" COMMUTATOR BRUSH GETS ON INSULATION THE "L" RELAY LOSES ITS SECOND LOCKING PATH AND RELEASES.
6. THE #3 TRIP FINGER ENGAGES THE #3 MULTIPLE BRUSHES TRIP LEVER.
7. WHEN THE SELECTOR SEQ. SW. ADVANCES TO 4 THE "L" RELAY LOSES ITS OPERATING PATH BUT STAYS UP BY LOCKING PATH ONE.
8. WHEN THE "B" COMMUTATOR BRUSH MAKES ON A "B" SEGMENT THE "L" RELAY HAS A SECOND LOCKING PATH.
9. WHEN THE "B" COMMUTATOR BRUSH BREAKS FROM A "B" SEGMENT THE "L" RELAY LOSES ITS SECOND LOCKING PATH.
10. THE "L" RELAY RELEASES WHEN THE "BO" OPERATES IN THE SENDER AND THE "B" COMMUTATOR BRUSH GETS ON INSULATION.
11. IF THE "TENS" DIGIT IS DIALED THE "STP" AND "L" OPERATE WITH THE SEL. SEQ. SW. IN 3 AND THE SENDER SEQ. SW. IN 4.

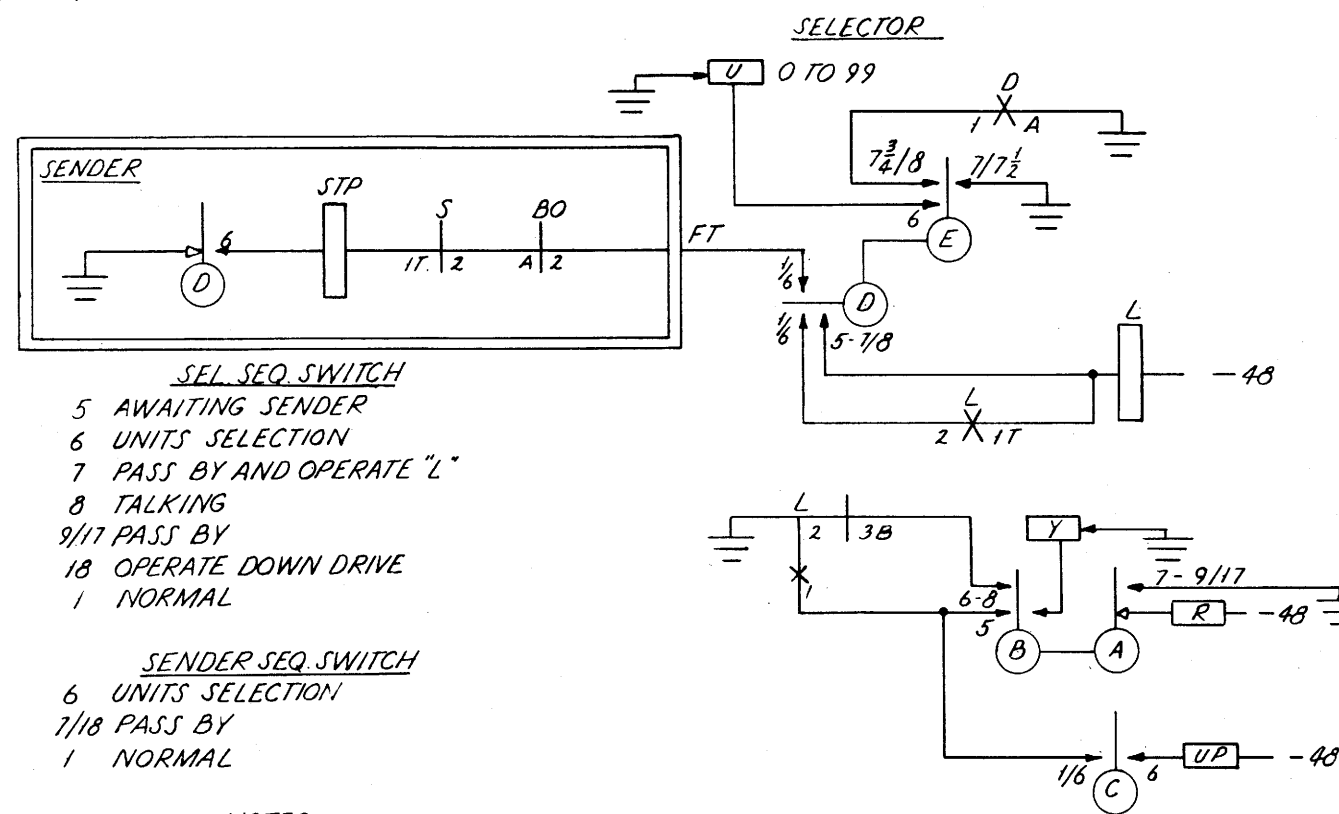
SEQUENCE CHART - TENS SELECTION



SEQUENCE CHART - BRUSH SELECTION

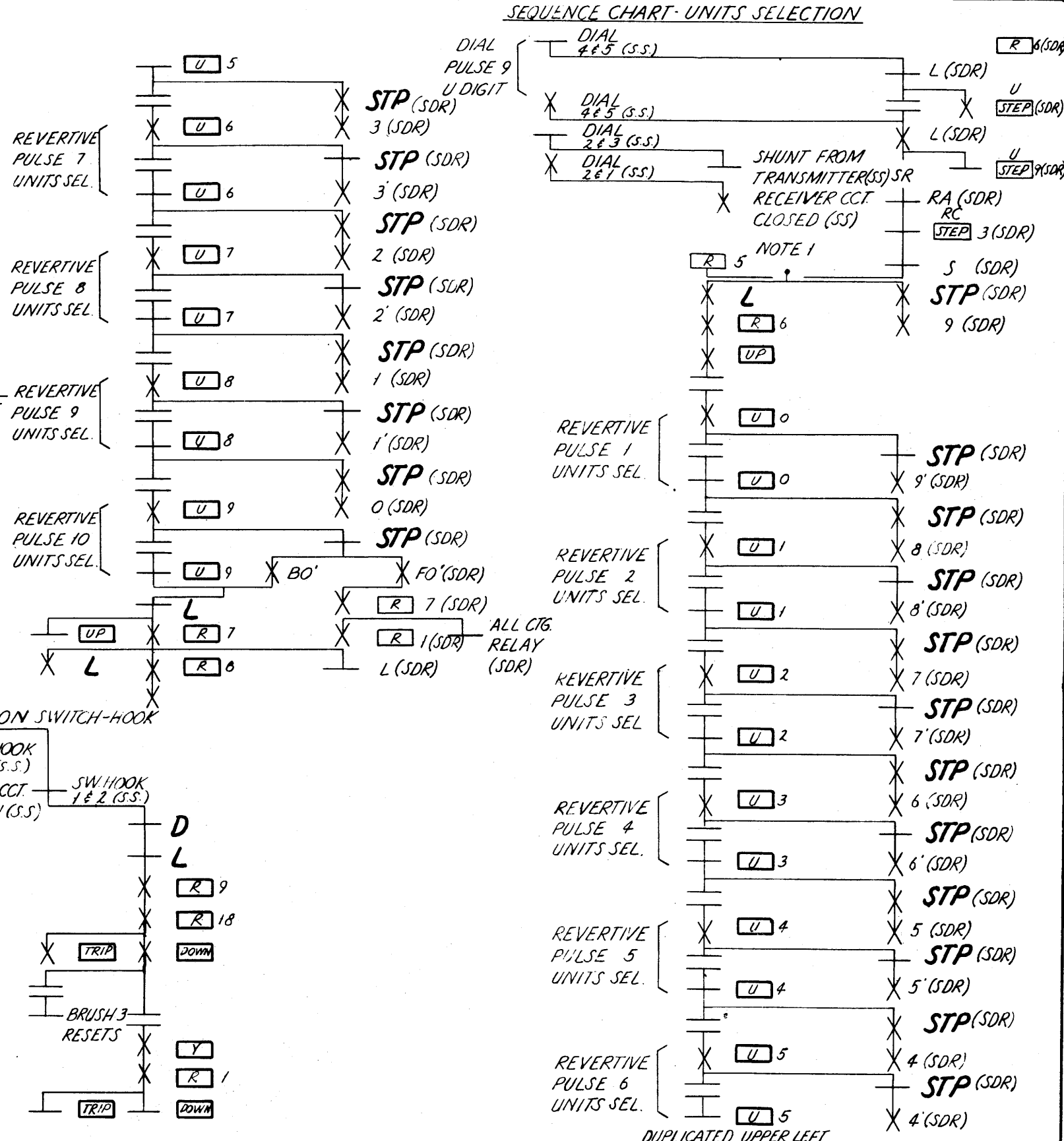
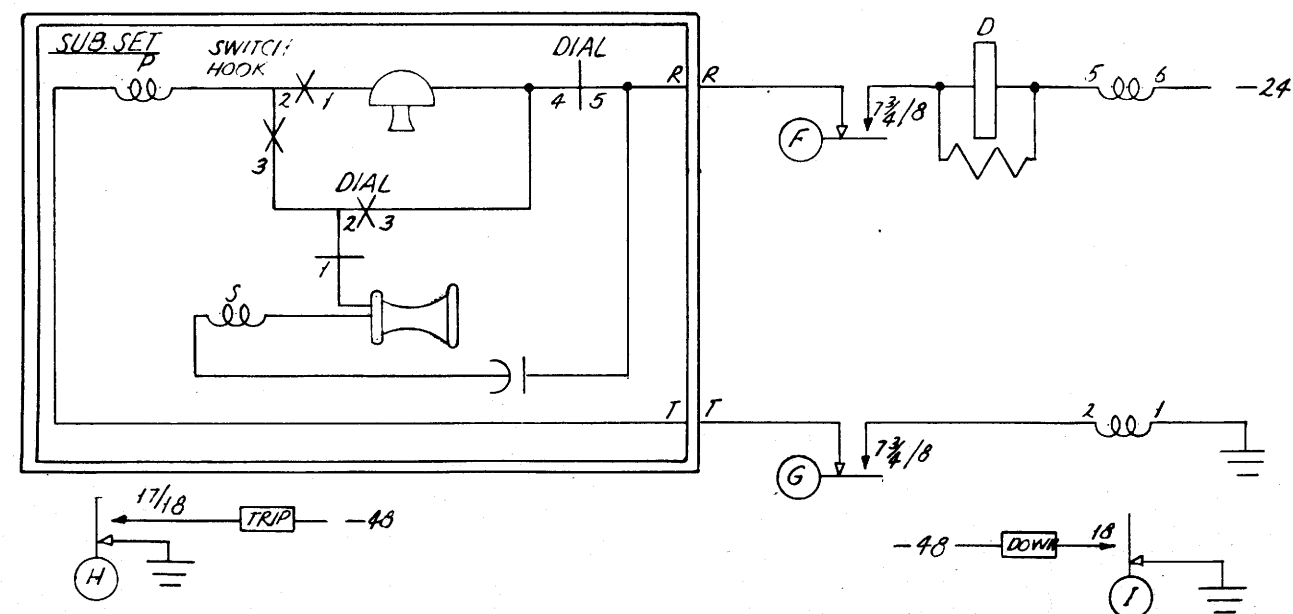


**SELECTOR
BRUSH SELECTION
GROUP OR TENS SELECTION**



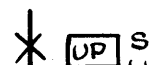
NOTES

1. IF THE UNITS DIGIT IS DIALED WHEN THE SELECTOR SEQ. SW. ADVANCES TO 5 THE "Z" AND "JTP" OPERATE IF THE SENDER SEQ. SW. IS IN POSITION 6

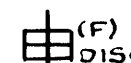
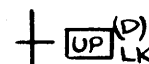


**SELECTOR
UNITS SELECTION
RESTORING TO NORMAL**

1. RELAY OR OTHER APPARATUS OPERATIONS AND RELEASES ONLY ARE SHOWN.
2. VERTICAL PROGRESSION DOWNWARD SHOWS THE TIME PHASE OF RELAY MOVEMENTS (OPERATIONS OR RELEASES)
3. OPERATE SYMBOLS:

- (A)  A INDICATES A RELAY COMES TO FULLY OPERATED CONDITION AT THIS POINT. FOR POLARIZED RELAYS, THE ARMATURE HAS MOVED TO FRONT OR LEFT CONTACT.
- (B)  (B) CHG INDICATES INTERRUPTER CHG HAS CLOSED ITS BACK CONTACT.
- (C)  R² LK INDICATES LINK SEQUENCE SWITCH HAS ADVANCED TO POSITION 2.
- (D)  UP^S LK INDICATES LINK SENDER SELECTOR UP-DRIVE MAGNET IS OPERATED.

4. RELEASE SYMBOLS:

- (A)  B INDICATES B RELAY COMES TO FULLY RELEASED CONDITION AT THIS POINT. FOR POLARIZED RELAYS, THE ARMATURE HAS MOVED TO BACK OR RIGHT CONTACT.
- (B)  (F) DISC INDICATES INTERRUPTER DISC HAS OPENED ITS FRONT CONTACT.
- (C)  (P) UP^D LK INDICATES LINK CIRCUIT DISTRICT SELECTOR UP-DRIVE MAGNET IS RELEASED.

5. SYMBOL NOTATION:

- (A)  SS- INDICATES ONE OR MORE OF THE RELAYS DESIGNATED SSATO SSK HAVE OPERATED.
- (B)  AI-5 INDICATES ALL OF THE RELAYS DESIGNATED A1 TO A5 HAVE OPERATED.
- (C)  GA, SW INDICATES BOTH GA AND SW RELAYS HAVE OPERATED FROM THE SAME CAUSE.
- (D)  A/B INDICATES THAT EITHER ONE OF THE RELAYS HAS OPERATED.

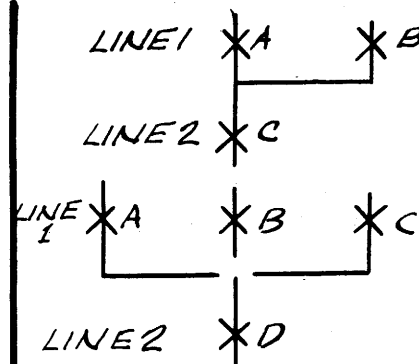
6. CONNECTING LINES:

- (A) VERTICAL LINES ARE USED TO LINK CAUSES WITH EFFECTS ON SUCCEEDING LINES AS:

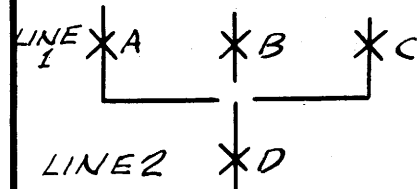
LINE 1  L INDICATES THAT THE L RELAY ON LINE 2 HAS OPERATED AS A RESULT OF L RELAY OPERATING ON LINE 1.

LINE 2  LI

- (B) HORIZONTAL OR OBLIQUE LINES ARE USED TO CONNECT MULTIPLE CAUSES SO AS TO INDICATE THEIR COMMON EFFECT OR TO CONNECT MULTIPLE EFFECTS TO INDICATE THEIR COMMON CAUSE AS:



INDICATES THAT THE C RELAY HAS OPERATED ON LINE 2 AS A RESULT OF BOTH A AND B OPERATION ON LINE 1. NEITHER A NOR B OPERATION ALONE IS SUFFICIENT TO OPERATE C RELAY.

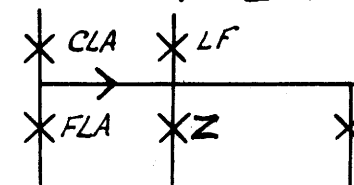


INDICATES THAT THE D RELAY HAS OPERATED ON LINE 2 AS A RESULT OF EITHER A, B, OR C RELAY OPERATION ON LINE 1.

7. ARROWHEADS:

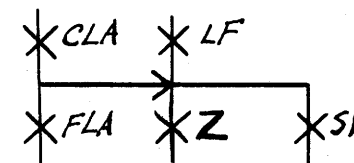
ARROWHEADS ARE USED TO SHOW THE PRECISE MEANING TO BE ATTACHED TO THE CONNECTING LINE.

(A) IF ARROWHEAD IS ON A HORIZONTAL LINE AND IS LOCATED BETWEEN TWO VERTICAL LINES, IT GIVES THE HORIZONTAL LINE DIRECTION INsofar AS CAUSE TO EFFECT IS CONCERNED. FOR EXAMPLE:



INDICATES Z AND SW WILL NOT OPERATE UNTIL BOTH THE LF AND CLA HAVE OPERATED BUT THE FLA WILL OPERATE INDEPENDENTLY OF THE LF.

(B) IF ARROWHEAD IS ON A HORIZONTAL ADJOINING A VERTICAL LINE THE EFFECT OF THE ARROWHEAD IS LIMITED TO THE OPERATION SHOWN DIRECTLY BELOW: FOR EXAMPLE:

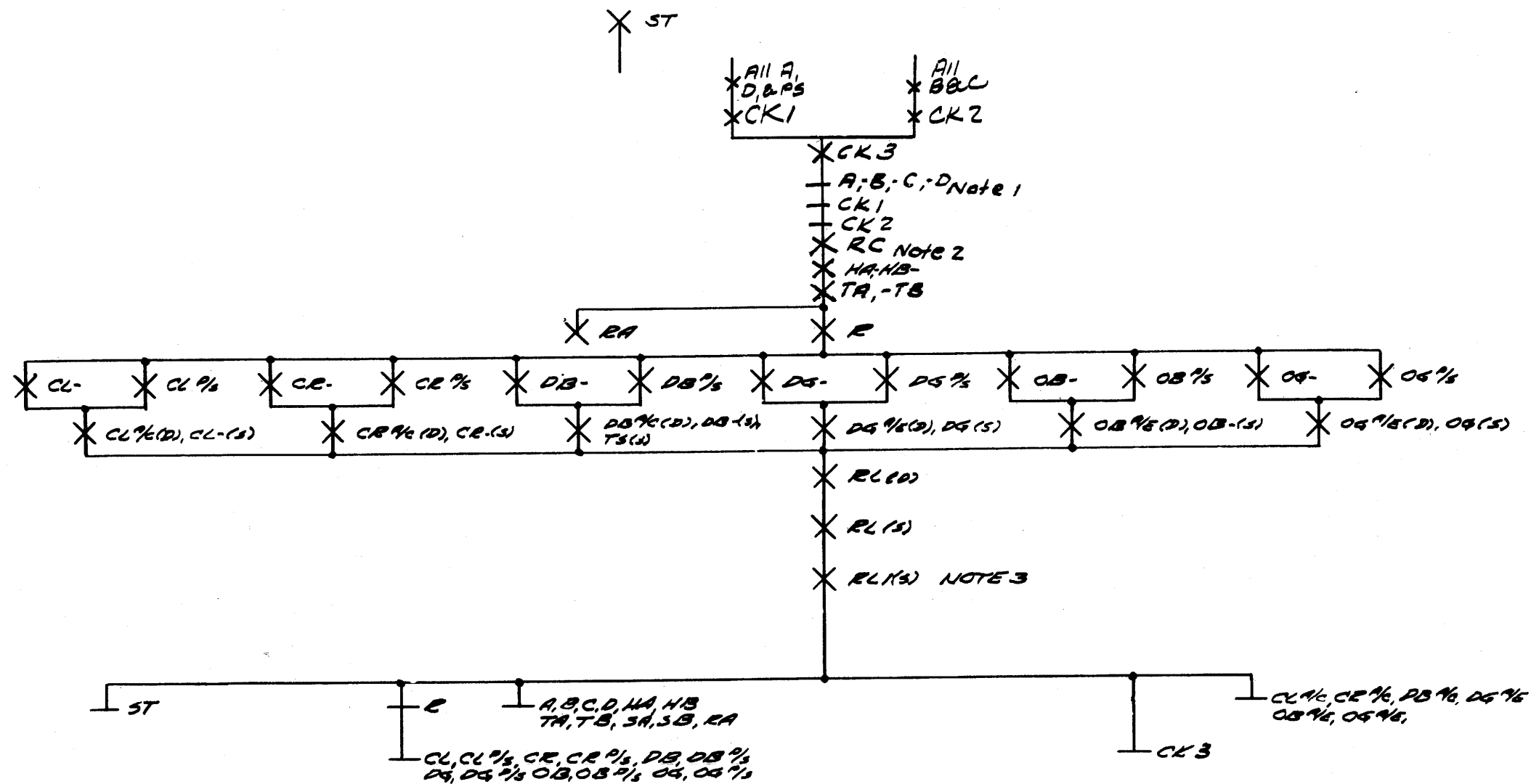


INDICATES SW IS OPERATING FROM LF ONLY; THE Z FROM THE LF AND CLA; AND THE FLA FROM THE CLA ONLY.

INDICATES TIME INTERVAL

PLANT SCHOOL
FOR TRAINING PURPOSES ONLY
LEGEND FOR
SEQUENCE CHARTS

PANEL SYSTEM
BATTERY CUT-OFF SC-300



NOTES

1. WHEN "CK3" OPERATES, "A" "B" "C" "D" RELAYS RELEASE EXCEPT THOSE HELD BY SENDER RELAYS.
2. "A" "B" "C" RELAYS HELD OPERATED AFTER "CK3" OPERATES, OPERATE "HA", "HB", "TA", "TB" "D" RELAYS OPERATE "SA", "SB".
3. WHEN "RL1" (S) OPERATES ALL CONNECTOR RELAYS RELEASE OPENING ALL LEADS TO DECODER.

<u>CIRCUIT</u>	<u>DRAWING</u>	<u>ISSUE</u>
LINE - TRIP - START & LINK CIRCUIT	SD-20294-01	31D
LINE FINDER & DISTRICT CIRCUIT	SD-21077-011	20D
" " " "	-012	18D
DECODER CONNECTOR CIRCUIT	SD-21187-011	15D
" " "	-012	"
" " "	-013	"
" " "	-014	"
DECODER CIRCUIT	SD-21277-011	25D
" "	-012	"
" "	-013	"
" "	-014	"
" "	-015	"
" "	-016	"
" "	-017	"
" "	-018	"
" "	-019	"
INCOMING SELECTOR CIRCUIT FROM PANEL-LOCAL OR TANDEM	SD-21115-011	24D
" " " " " " " "	-012	"
3-WIRE OFFICE SELECTOR CIRCUIT	ES-240252	9D
FINAL SELECTOR CIRCUIT	SD-21200-01	12D
LINE FINDER-DISTRICT SELECTOR CIRCUIT 2-PARTY	SD-21079-011	18D
" " " " " "	-012	17D
" " " " " "	-013	"
LINE FINDER-DISTRICT & COIN CONTROL CIRCUIT	SD-21350-011	19D
" " " " " "	-012	"
" " " " " "	-013	"
SUBSCRIBERS SENDER CIRCUIT	SD-21193-0101	53D
" " "	-0102	"
" " "	-0103	"
" " "	-0104	"
" " "	-0105	"
" " "	-0106	"
" " "	-0107	"
" " "	-0108	"